SDY
1931

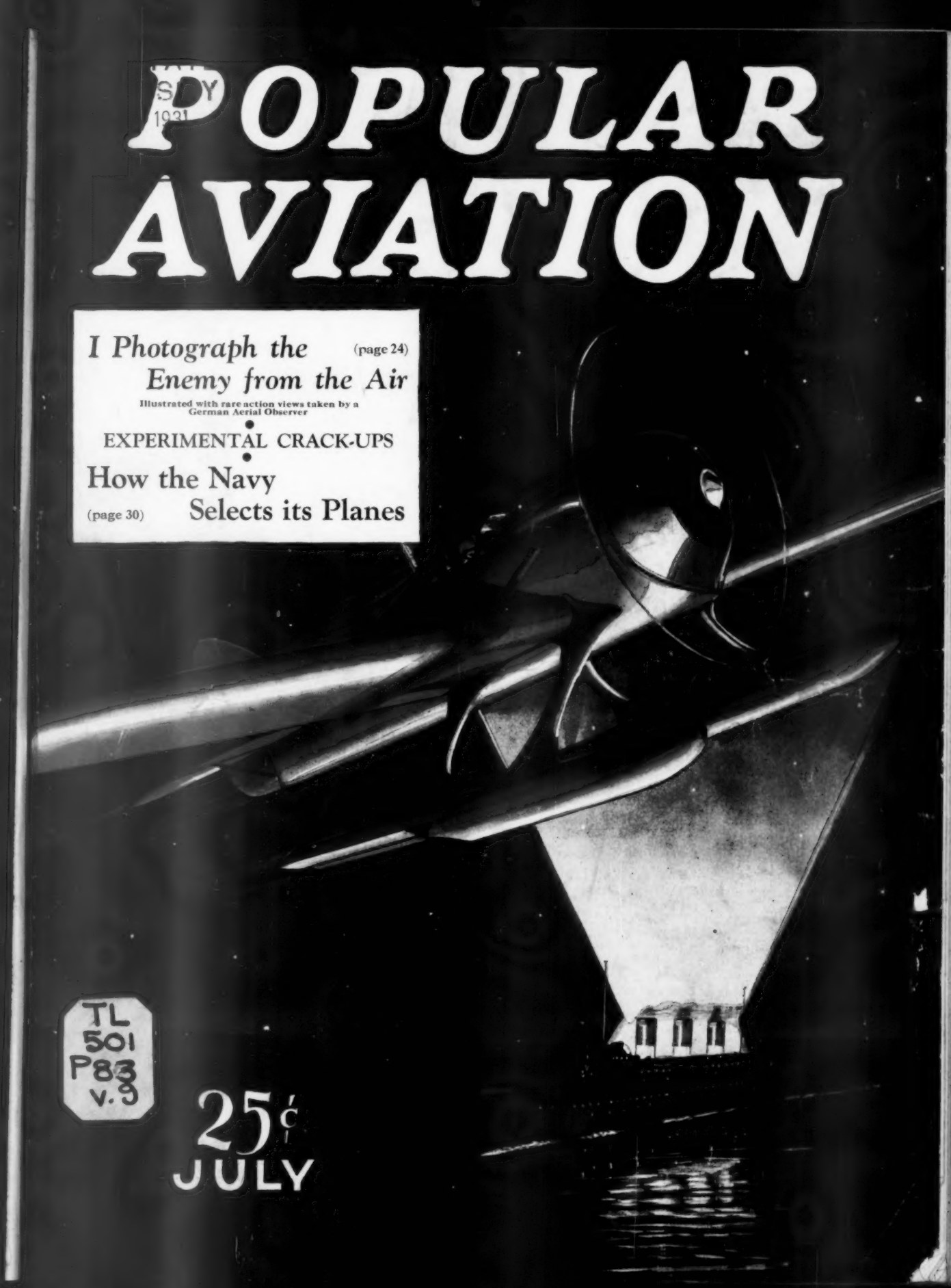
POPULAR AVIATION

I Photograph the Enemy from the Air (page 24)

Illustrated with rare action views taken by a German Aerial Observer

EXPERIMENTAL CRACK-UPS

How the Navy Selects its Planes (page 30)



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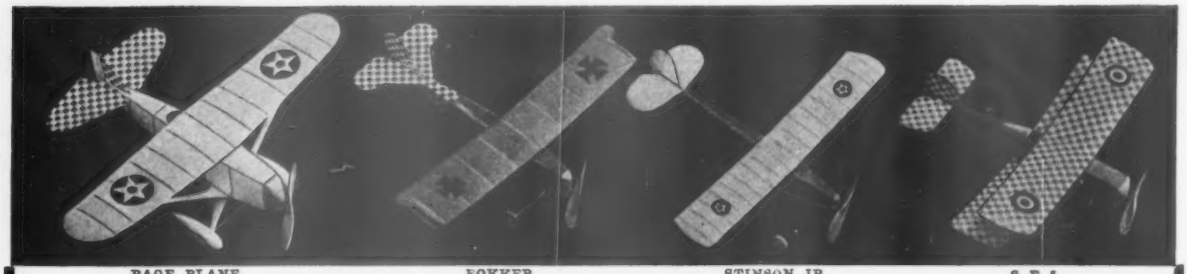

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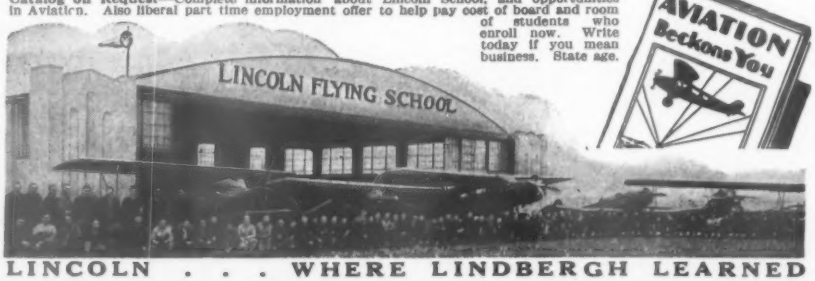

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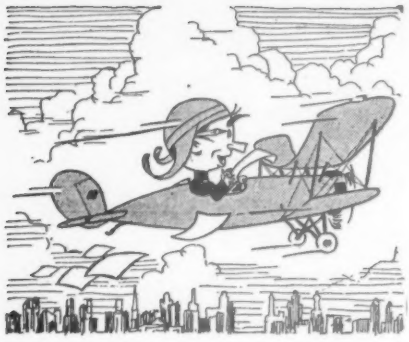

An Airy Chat With the Editor

THIS month Lieutenant Richardson sent us another installment of his book. His episode this time has to do with more unsung heroes of the war—those adventurous men who risked their lives daily in the clumsy observation balloons that played such an important part in the effectiveness of our artillery.

The exploits of this branch of the air service have received very little notice from post-war writers and we think that Lieutenant Richardson's accounts of "the eyes of the artillery" will be a very interesting and unusual variation from the usual type of war story.

Incidentally, we are fortunate this month in having another war story which gives an impression of the war from the point of view of one of our flying adversaries. Lieutenant Walter A. Heinsen has prepared an excellent yarn, drawing on his vivid memory to re-enact the scenes which he photographed from thousands of feet above the lines.

The photographs which accompany his articles were all taken by himself and are some of the most remarkable views of the war that we have ever seen. He sent along a half dozen other photographs which unfortunately were not clear enough for reproduction purposes.

We are going to try to get Lieutenant Heinsen to let us have some more of his reminiscences and we think that you will enjoy getting glimpses of the war from a German aviator's side of the lines.

* * *

MAJOR FALK HARMEL has sent us a very interesting story which we are holding for a future issue. Major Harmel is the custodian of the records of the "Caterpillar Club" and as such he has been in position to obtain some excellent first-hand accounts of air thrillers. This month Major Harmel draws on the knowledge he has obtained in analyzing the causes of the Caterpillar crashes to prepare an extremely interesting article on crashes and what has been done to eliminate them. As Ben Bernie would say, "We hope you like it."

* * *

WE still keep getting letters denouncing our old friend John B. Rathbun for being an old-fogey, back number, mossback and what have you?

John is too good a fellow to warrant such a barrage of condemnation, so in justice to him and to the many who have agreed with him, and also in explanation to our readers, we are (about three months late) giving you this statement as to why we published "The Years Go By, But Aviation Stands Still" in the March issue of POPULAR AVIATION.

The complete understanding of any subject requires a pretty good knowledge of what has gone before in order that present day developments can be properly appreciated in the light of past achievements. Aviation, although young in years, has gone through tremendous developments which is well known to many who have watched this development or to those newcomers to aviation who have studied its history.

Advisory Board

J. Don Alexander, Dealers' Sales; Louis Bleriot, French Activities; R. J. Goodman-Crouch, Engineering; Sherman Mills Fairchild, Aerial Photography; Warren Irving Glover, Air Mail; Lady Mary Heath, Women's Activities; Charles Sherman Jones, Flying Schools; Alexander Klemin, Aerodynamics and Structures; Emory S. Land, Aviation Safety; B. Russel Shaw, Airports.

Too many people today, however, are only too easily inclined to swallow the "hook, line and sinker" of aviation and believe implicitly that everything before Lindberg was chaos, that everything since him is not only new but actually the only thing that counts.

It would be manifestly impossible for POPULAR AVIATION even to attempt publishing the history of aviation in all its technical branches, so we welcomed the opportunity of letting Mr. Rathbun vent his spleen against those uninformed newcomers who would disparage the worthy achievements of the pioneers. Our only aim in doing this was to force some of you newcomers to find out something about this aviation business in which we are all interested.

If you passed over Mr. Rathbun's article with a shrug of the shoulders, then we have failed in our purpose. But if Mr. Rathbun's statement of fact fired you with a desire to go to your library and investigate the technical history of aviation, then we take pride in the thought that we have done our bit toward developing a background that will enable you to be a better missionary for the cause of flying.

* * *

AND now we are going to have to disappoint a lot of you good readers. Yes, it's the model boat contest that we're talking about. We had a good many hundred entries and it was a whale of a job for the three judges to read through every letter carefully and pick the ten winners. However long the task was, it was a pleasure to read the interesting comments on the boat plans that appeared in the April issue and after careful consideration the judges finally made the following awards:

The three finished motors go to Robert G. Eastman of McGraw, N. Y.,; Stanley Brown of Princeton, Ill., and Robert L. Anderson of Carroll, Ia.

The seven knockdown motor kits were awarded to Charles Couch of Glendale, Cal.; Louis Brandes of Fargo, N. D.; Howard G. McEntee of Ridgewood, N. J.; Ray Grayson of Terrace Park, Ohio; William Keefe of Danville, Ill.; Marshall C. Wood Jr. of Cortland, N. Y., and Hugh C. Hall of Henryetta, Okla.

The winners have received their prizes by this time and to those others who were not so fortunate we extend our appreciation for the part they played in making this contest so successful.

If you will remember, Mr. Ott was of the opinion that the boat plans would not be popular in an aviation magazine. Of course, it would be impossible to publish all the letters that disagreed with him, but you may be interested in seeing a part of one letter which leaves no doubt as to the opinion of the writer.

Mr. J. S. Ott.

If I should speak my mind, I'd say that I think you are the lousiest, pinheadedest, narrow-brained critter that ever was known. Why, if you multiplied the number of your brains by the cube of your telephone number and added in the national debt, they would

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POPULAR AVIATION

A magazine for everyone interested in Gliders—Lightplanes—Models

Volume 9 JULY, 1931 Number 1

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The RUNAWAY BALLOON

A unique and thrilling episode in the lives of two American artillery observers who found themselves adrift over No-Man's Land.

by LIEUT. JAMES M. RICHARDSON, D.S.C.

ON JULY 18, 1918, I became a member of the 1st Aero Squadron, one of the seven squadrons of the slowly evolving American Air Service engaged at Chateau-Thierry. We were pitted against a formidable concentration of German aerial units and the fierce air battles of that period together with the strafing of enemy troops naturally stand out most clearly in my mind.

Of the lesser sensations and sights of war, none made a more profound impression on me than captive balloons. I daresay that this is true of a great many airmen and ground troops alike, for there was something almost sinister in the appearance of a balloon.

Often during these early days at Chateau-Thierry I sailed high over our own balloon line and saw them riding down below like huge bloated caterpillars, buffeted by the wind and straining at their cables. It was some time later that I had my first chance to examine one.

On August 12, after the Germans had been forced out of the triangular Chateau-Thierry salient and were resisting stubbornly along the Vesle River, a few of us decided to proceed as far in the direction of Bazoches as possible in order to see what the war on the ground was like. Before stopping, we reached our balloon line, and I stood there for a few minutes looking at the great silver-gray bag nearest us.

I could not have chosen a better time for excitement. I was still looking at the balloon when I saw one of the men in the basket start signalling violently, saw the sausage bob jerkily in the air. An enemy plane had been sighted, and the men at the winch were straining to get the balloon to safety before the German reached it.

His machine could be plainly seen now; it was speeding towards us and the air about it was full of white archie puffs, most of these being behind the plane. A surprise for me lay in the fact that he was flying directly at the balloon on its own level, not troubling himself to waver in flight or to try the ruse of a steep dive.

He was still quite a distance away when the hellish chorus of the machine guns and small field pieces protecting the sausage broke loose. Such a din I never heard. If the gunners had concerted their fire, no attacking plane could have plunged through it. As it was, the Pfalz was not checked. The pilot kept his straight course, dipped his plane slightly, poured a rain of bullets into the side of the sausage and pulled away in a wide, climbing turn.

What worried me most was that the observers in the basket waited so long to jump. Whether this was their regular method or because of the surprise nature of the particular attack I witnessed is more than I know. But at last, with the plane roaring skyward, they did come out.

I was never so relieved as when I saw both of them jump and their parachutes open gracefully like a lady's umbrella. Had they waited a minute longer they would surely have perished, for the flames leaped out all over the sausage, causing it to burn with incredible speed. In the meantime the Pfalz was climbing ahead into Germany, apparently in good condition.

WHAT I had seen made me determine that there were safer jobs than those offered by the balloon corps, and I felt rather glad that I was taking my war from an airplane. I was, in fact, not quite convinced that the artillery had a bomb-proof occupation. The German heavies were throwing occasional shells back to the point of our balloon line, and each time they whined through the air I deposited myself behind the thickest stone wall in sight.

The excitement of the day was not over when the first balloon burned. Nearby was another, and I saw a second German plane diving steeply on it a few minutes later. I spotted this fellow before the machine gunners opened up on him, and I soon noticed that their fire was effective. The plane —another Pfalz—not only did not burn his intended prey, but he barely missed ramming the end of it. Then he levelled off slightly and crashed a few hundred yards away.

Interested in seeing the Pfalz, I walked to where it crashed. It was a trim machine, practically new. It had a blue tail, silver wings and a white arrow running on the side of the fuselage from the cockpit to the rear flippers. The poor pilot had been killed in flight by a bullet.

The next time I approached an observation balloon was in September at St. Mihiel to learn the details of the accidental death of Eddie Orr of Chicago, Illinois, a very dear friend of mine, who had crashed into a balloon cable.

I had always feared those cables, but from that time on was doubly wary of them. The position of the sausage was never a positive indication of the position of the anchoring cable for the reason that the wind forced the sausage before it just as it does a kite, and the cable lay out behind at an angle like that made by a kite string.

The balloon men on the ground told me of another reason why American airmen flying at low altitudes should steer far to one side of sausages. After a recent incident the machine gunners might fire on them in the belief that they were Germans. Here is the story they told me:

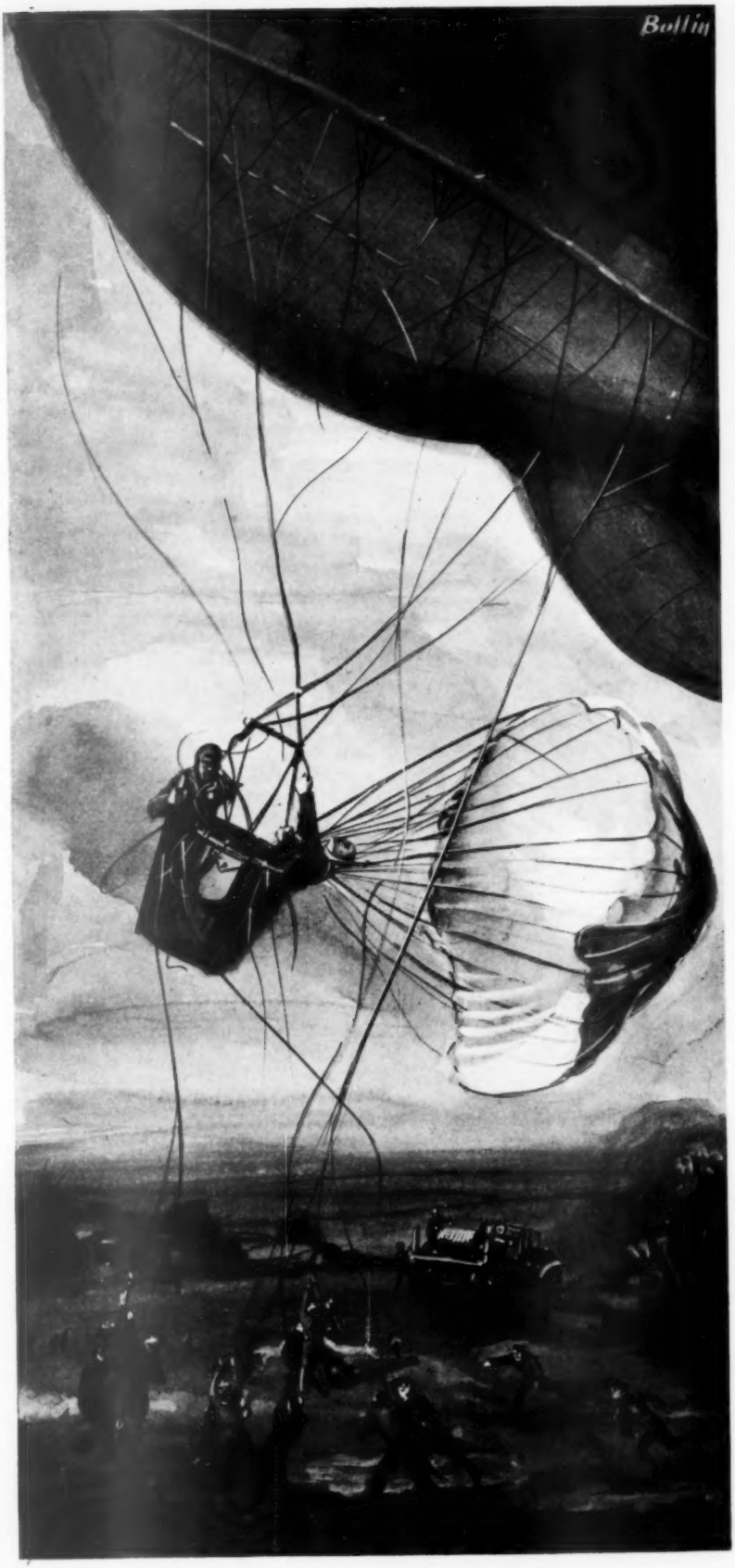
They had seen a French machine—a Breguet—flying up and down near our balloon line one day two weeks earlier. Nobody had given it any thought; the machine was plainly marked with Allied insignia; there was nothing about it to make one suspicious. Suddenly the pilot of the Breguet had turned in towards the balloon and set it on fire, climbing away in the direction of the lines before our gunners had realized the true situation.

Before the Breguet had reached the front, however, two Frenchmen in Spads had shot it down. It developed that this German pilot in a captured Breguet had burnt several balloons on the French sector, causing the French to lie in wait for him.

Granting that the American Air Service had wanted to use a captured German plane in the same manner, it could not have done so without subjecting the pilot appointed for the mission to extreme danger. We lacked the same cooperation between the different branches of our Air Service and the different arms of our forces that existed in the German army. The Germans had developed this feature to a high state of perfection.

THE members of the balloon company I visited were cordial, so I stayed there several hours. While talking to a lieutenant, I heard the distant hum of motors in our rear and soon saw six Spads flying in our direction at a low altitude. The wind was on their tail and they sped along about two miles a minute. I judged from their low altitude that they were on their way to strafe the enemy troops.

"They certainly do buzz along," the lieutenant said. "Nothing in the world could get me up in one of those things. If something goes wrong, you haven't got the chance of a snowball in a melting vat. No parachute—no nothing. Umph—uh! I'll stick to balloons."



Among the unsung heroes of the war, the balloon observer ranks high. At the mercy of swift enemy planes, these courageous fighters risked death daily to direct and observe the effect of their artillery's gun fire.

●

"That's amusing," I replied. "I was just thinking the same thing about your balloons. It seems to me that the risk involved in flying a plane is less than what you run in a sausage. Sausages churn about in the air, the Huns burn them. And it makes me shudder to think of jumping out with a parachute."

"That is a very simple matter," he said, smiling. "I don't consider it a great risk."

"About the only thing you need not worry over is the possibility of capture by the Germans," I said.

"I'm not so sure of that," he said. "One of our balloons broke away a short while ago and was either shot down or fell in Germany. We've had no news of it, but we know the wind took it across the lines."

Many weeks later I heard the whole story of what happened to this runaway balloon. The Twelfth Balloon Company had a sausage about two kilometers south of Sommedieu on the morning the St. Mihiel drive started.

Near the balloon Captain Small had a number of 400 mm. guns that had been placed to throw shells on the railroad yards at Conflans. The drive went ahead as scheduled, and Small was anxious to do all he could to demoralize the enemy. When it got light, he wanted the balloon company to make an ascension to check the accuracy of his fire on the railroad yards.

The balloon men were loath to go aloft. A damp, swirling fog barely cleared the tree tops of the rugged encircling hills, a high wind was blowing, the winch was poorly situated between two hills and faced the direction of the wind. But in spite of the fact that they had nothing in their favor, it was finally decided to try an ascension. The great American drive was on, and now, if ever, they should strain a point to aid.

THE decision made, everything was prepared hurriedly. Lieutenants George W. Hinman and R. S. Tait climbed into the basket with their paraphernalia, gave the signal to their helpers, the giant bag mounted steadily and soon began tugging violently at the winch. Before it reached 1,500 feet, it was entirely out of sight from the ground.

Hinman and Tait could see nothing

"His parachute harness slipped up to his throat and nearly choked him to insensibility—but this was only the beginning of their troubles."

in the maze of clouds and fog that whirled about them and impeded visibility. Up above, the wind was worse than on the ground; it tore into the balloon and swung it about fiercely in wide circles; it gave the observers the roughest and wildest ride they ever had.

It is recorded that "Lieutenant Tait was very sick" from all this motion, and at the end of fifteen minutes the ground crew started hauling the balloon down. For a time it came along nicely but either the too rapid rate at which it was being hauled down or the sudden shift of the bag from broadside to tail in the wind caused it to make a wild nose dive toward the ground, narrowly missing the ground crew.

Extraordinary excitement ensued. The men who operated the winch and those on the basket detail rushed to the assistance of the observers.

In some way one of them slipped over Lieutenant Hinman's parachute rope and pulled the parachute out of the container. Just then the balloon rose again, the man fell heavily on the ground and the parachute tumbled over the side of the basket.

The upward surge of the basket put Hinman in a very dangerous position; his parachute, dragging in the wind, opened up, and the force of its drag pulled his head and shoulders to the edge of the basket and wedged him there so that he could not move.

Then the chest strap on his parachute harness slipped upward to his throat and would have choked him to insensibility, had not Lieutenant Tait, himself enmeshed in the telephone cords, acted quickly. Tait grabbed a knife and slashed frantically at the telephone cords until he was free. It took him but a second to leap over and valve the balloon sufficiently to check its progress until Hinman could be released.

This was only the beginning of their troubles. The balloon rose speedily, pitching and lurching as it had done before. Instead of stopping at the end of its tether, it snapped the cable and broke completely away, furnishing Hinman and Tait the uncanny and alarming sensation of being adrift.

They rushed to the edge of the basket and looked over. Could Hinman rely on his damaged parachute in a leap to the earth? Even if he could, should they desert their balloon? They decided to let Tait, who was a free balloon pilot, try to bring the runaway to the earth immediately.

Tait valved the bag and it sank rapidly. But they gave up any idea of landing at this point after they got their first peep at the ground, dim through the fog. They saw the flashes of the American artillery, they heard the shells whistling through the air beside them. It was evident that they could choose a healthier place to moor their charge. They must gain some altitude and drift to a quieter spot.

IN ORDER to get the necessary altitude, nearly everything of weight was sacrificed. They threw out maps and photographs, four pairs of glasses, one thermos bottle of coffee, one large round loaf of bread, one can of beans, one can of corned beef, the telephone and the swinging chair. Thus unburdened, the balloon rose rapidly to a height of 12,000 feet. Here they watched the bag expand and grow tight. They searched impatiently for a glimpse of the earth, but the clouds quite obscured it. All the time they were drifting at a rapid rate.

They did not forget the possibility of meeting enemy airplanes, and the thought of it made them search the heavens and peer at the surging clouds below. These reflected the sun brilliantly and kept them anxious lest

Dogan Arthur, whose war experiences were told in April Popular Aviation, took this photo of a sausage balloon behind the lines.

planes slip up from that quarter unobserved.

They had been in the air about thirty minutes when the clouds began to break up and anti-aircraft shells started bursting near them. They did not relish the idea of having one of these destroy the balloon, so Tait valved it and made a rapid descent. Too rapid, in fact, and they had to check the mad downward plunge by clearing the basket of the last few remaining articles.

About fifty feet from the ground the balloon was ripped fully half open, with the result that the basket crashed hard but on one edge. The principal part of the gas left was in the nose, and the lifting power of that section held the flabby tail over the basket into which it hung.

Then for some reason, before Tait and Hinman could jump out, the buoyancy which the balloon still possessed took it off the ground. Scrambling for the dangling rip cord, both lieutenants grabbed it and ripped the balloon wide open. Again the basket sank to the earth, where it was dragged along until it tripped over and the observers rolled out.

Just as they fancied themselves free, however, the rigging caught them and dragged them along the ground, sliding Tait on his stomach much in the manner that cowboys in a circus drag the desperado behind their horses. Hinman had an easier time of it: he balanced himself with the valve cord and rode the trailing edge of the deflated bag.

In one way it was a vast relief to have the sausage come to a complete halt, in another it was disappointing. They had passed over Conflans and landed on the German border near the village of Habonville, a distance of 42 kilometers (26 miles) from their winch.

They were quickly surrounded and made prisoners, without having the opportunity of burning the balloon. The last time they saw the ill-fated sausage, it was tossing clumsily about in the high wind.

THE German intelligence officers who questioned Tait and Hinman were a little harsh. To punish the balloon lieutenants for their refusal to talk, they ordered them taken to Conflans, then under our own artillery fire—and a very effective fire, as Hinman and Tait discovered. From the way shells fell into the city, it was evident that Captain Small and his boys had got somebody else to check the fire adjustment for them.

At four-thirty in the afternoon the guards took the Americans to the railroad station. While they waited for their train, several shells burst in the yards outside; another hit their train and the station, wounding many soldiers by fragments.

For a couple of days Hinman and Tait were shifted about from Metz to Montmedy and back again, being exposed to air raids wherever they settled for an hour or two. Finally they worked back to Karlsruhe and from there went to a prison camp in the interior of Germany.

Considered from some angles, war was a business of adverse fortune. You may think that Hinman and Tait had a tough time of it, but to me the most extreme case of hard luck was the experience of a certain French balloon observer.

While directing artillery fire, this fellow discovered a German plane diving towards his balloon. He, very naturally, assumed that the German would burn the sausage, so he jumped. The machine guns surrounding the sausage put up a hot barrage to turn the Fokker away, but the Fokker rode through, fired a short burst into the bag and pulled up in a quick turn without setting fire to his target.

Just then the anti-aircraft batteries, so ineffective that they scored but one hit out of ten thousand attempts, started shooting and one of their shells made a direct hit on the German plane, blowing it to pieces instantly. One of the fragments of the plane in its downward plunge fell on the parachute and wrecked it, causing the poor Frenchman to drop to his death.

Such are the fortunes of war.

Can You Say "Szekely"? Here's How

J. E. MUTCHLER of Miles City, Montana, started something when he wrote us the following letter:

"I am sending you a list of aviation terms that it seems every one from the would-be aviator to the seasoned pilot pronounces differently.

"Will you kindly give me the correct pronunciation of 1—Dihedral. 2—Dural. 3—Fokker. 4—Monocoque. 5—Molybdenum. 6—Szekely and 7—Waco."

Well, we went after these disputed words with these results:

1—Dihedral is pronounced as if it were written by Die-*hee*-dral.

2—Dural is such a new product that its name has not yet found its way into the unabridged dictionary, but we believe the correct prounciation is Dur-**al**.

3—Anthony H. G. Fokker's name is often heard in several variations. His secretary says "it is pretty hard to define, but I guess the 'o' in 'often' is the best English equivalent" of the sound of the "o" in Fokker.

4—Monocoque is another word that is not in any dictionary that we could find. Our knowledge of French, however, would lead us to believe that it is pronounced as if written Mon-o-cawk.

5—The preferred pronunciation of Molybdenum is as if it were written Mo-lib-den-um.

6—From the General Manager of Szekely Aircraft and Engine Company, we learn that Mr. O. E. Szekely's name "is pronounced as if it were written 'Say-kay,' with both syllables pronounced plainly and a slight accent on the first syllable, but no decided accent on either one."

7—From the Waco Aircraft Company we have the following letter:

"The correct pronunciation of Waco is the same as the 'o' in 'locker.' We have found that the prounciation applied to this word is different in the different parts of the country. Those from the south who are familiar with Waco, Texas, which is pronounced the same as 'a' in 'way' call it by that name. Those in the vicinity within a radius of three or four states around Ohio usually pronounce it correctly and from other parts of the country we ordinarily get the name pronounced with the 'a' like that in 'fact.'

This business of prounciation is an interesting one—for instance, did you know that Lockheed assumed its present name because the Loughead brothers who started the company were tired of being called "log-heads?"

Well, this completes the list of names that Mr. Mutchler sent us. If there are any other aviation terms that bother any of you, send them in to POPULAR AVIATION and we'll see what we can do about it.

Alexander Introduces New Cabin Lightplane

The two-place Alexander D-1, as it appeared at the Detroit Show.

THE Alexander Aircraft Company has entered the lightplane class with a 2-place closed tractor type plane. It is known as the D-1, a high wing monoplane powered with a Continental 35 horsepower motor.

This particular type ship was built after much investigation and experimenting. The seating arrangement is side by side, with enough cabin space for two people to sit comfortably. The interior is upholstered, making the cabin cozy. There are large doors on both sides of the fuselage, making the ship very convenient to the passenger.

Large spacious windows allow perfect unobstructed visability on either side and in front of the ship. These windows can all be lowered, giving the effect of an open ship. The instrument board is mounted on the gas tank with the throttle in the center. All instruments are new type Consolidated, composing altimeter, tachometer, oil pressure gauge, oil fahrenheit and switch.

The power plant is the 35 horsepower Continental motor. The propeller is wood with no tip. The gas capacity is 8½ gallons, giving the ship a nice cruising range. The most important factor about this type ship is the unusually low operation cost. The actual oil and gas consumption is much less than the average automobile.

Specifications

Wing Span	37'9"
Length Overall	21'4⅝"
Height Overall	5'8½"
Chord	5'
Gasoline Capacity	8 Gallons
Total Weight Empty	536.5 Lbs.
Useful Load	425.5 Lbs.
High Speed	85 M.P.H.
Landing Speed	34 M.P.H.
Rate of Climb	650 F.P.M.
Cruising Speed	75 M.P.H.
Cruising Radius	175 Miles
Fuel Milage	25 M.P.G.

Parachute Jumper Trusts Life to Paste

A DARING flying stunt was performed by the well-known German parachute jumper, Arnold Waldau, at the Barkarby flying field, near Stockholm, Sweden.

Waldau clung to a rope which was attached to a military plane, and flew round the city three times before he made his parachute jump, the 48th of his career. The rope was only gummed to a leather band fixed to the plane, with the newly-invented "Metallfix" paste. The demonstration was arranged by the paste manufacturer to show the quality of his product.

New York Develops New Base for Dirigibles

THE development of New York as a base for the operations of dirigibles moved a step closer to actuality when ground was recently broken at Holmes Airport in Jackson Heights for the first commercial airship dock or hangar in the East.

Within a short time, the new airship hangar will be completed. Towering almost 100 feet into the air, it will be the first unit of a development which will make Holmes Airport the operation base for dirigible operations in the East.

The Goodyear Tire & Rubber Company has taken a five-year lease on the dock, with a renewal option. The largest ship of the Goodyear fleet of Dirigibles, the "Defender," is due to make New York its headquarters on June 1st.

Three dirigible crews will be stationed at Holmes Airport in 24 hour readiness to service the gas bags. Spare stocks of helium, as well as motor and dirigible repair parts, will be carried in stock at the airport.

Upon the completion of the hangar, the Goodyear Company will inaugurate a daily dirigible airship service from Holmes Airport over New York City and its environs—the first dirigible airship service in the world.

D. C. Announces New School Regulations

A REVISED edition of the requirements of the Department of Commerce which shall be met by civilian schools giving instruction in flying in order to be eligible for classification as approved schools has just been published.

The new requirements do not make it necessary for a student to complete a course in a given amount of time nor do they stipulate what per cent of the enrolled students should be graduated. It was formerly required that the entire course should be completed in 4 months for private course, 6 months for limited commercial course, and 18 months for transport course. A school was required also to graduate 66 2/3 per cent of the students from the course for which they enrolled.

The requirement was added that ground schools not providing flight instruction shall be required to affiliate or make suitable arrangements with an approved flying school to provide necessary flight instruction before they will be eligible for approval.

Hawks Thrills Europe

Wherever the crowd is, you can be sure to find Frank Hawks in the center.

CAPT. FRANK M. HAWKS is making speed records over in Europe faster than we can publish them.

However, we just received this view of the famous flyer as he landed in Rome after making the trip from London in 5½ hours—7½ hours better than the former record.

Hawks is shown in the cockpit of the Texaco 13 surrounded by an admiring group of airport attendants.

Liberty Lightplane Now in Production

PRODUCTION of the new Liberty monoplane, which combines large plane performance with small plane price and operating cost, and has the additional advantage of side by side seating for the pilot and passenger, has been started by the Liberty Aircraft Sales and Manufacturing Co.

Performance of the Liberty is being checked by the Department of Commerce for an approved type certificate. The plane is stressed and built to large plane specifications. It is powered by a Szekeley 45 h.p. motor, cruises at 78 miles an hour and has a top speed of 90 miles an hour. The rate of climb is 750 feet the first minute, cruising range, 400 miles on fifteen gallons, and landing speed, 28 miles an hour.

The Liberty takes off in 6½ seconds and has a theoretical absolute ceiling of 18,500 feet and a service ceiling of 15,000 feet. Besides its initial cost of $1,495, the plane can be flown at a cost of only $1 an hour, for gasoline and oil. The mileage is about 25 miles to the gallon, which compares favorably with the mileage of a small automobile.

Standard equipment for the Liberty includes a choice of any two colors, fifteen gallon gas tank, dual controls, wood propellor with metal tips, tachometer, altimeter, oil pressure gauge, fahrenheit gauge, switch and gas gauge on the instrument panel. A fire extinguisher, first aid kit, safety belt and log books are also provided.

Outstanding features of the plane's construction are the adjustable stabilizer, which is controlled from the cockpit, the detachable motor mount and the landing gear with 16x7 airwheels and shock absorber. The wings are fabric covered, of wood spars and metal ribs; the fuselage of welded steel tubing with four longerons; the ailerons are the Friese metal type and the controls are operated by torque and push pull tube and direct cables, with no pulleys.

The plane is 19 feet, 6 inches long, has a wing span of 35 feet and a chord of 52 inches. The wing area, including the ailerons, is 145 square feet, and the plane is 6 feet, 4 inches, in height.

The new Liberty monoplane is a side-by-side two seater with good performance and pleasing appearance.

An Early Air Meet

by SUZANNE M. POTTER

IN THE fall of 1920 an Air Derby was held at Dubuque, Iowa, to which all owners of airplanes in the middle west were invited. Being the proud owner of a plane, I was included and joined in what everyone hoped would be a demonstration to the public that air travel was safe and that civil aviation was here to stay.

The program called for a few exhibitions such as Immelman's, tail spins, wing-over-eights, tight and wide spirals, falling-leaf, and some formation flying (as most of the pilots present had seen war service in the aviation division), but was primarily to persuade the public to fly or ride, and most of the time was to be spent in carrying passengers.

Early in the summer a young man by the name of "Shorty" Aiken had approached me with a proposition that I allow him to do some tricks on the wings of my plane while in the air; but as I have always held that safe and sane aviation has no place for freak stunts I had said a firm "No."

So on the afternoon of the Derby I was not surprised when he came to me and said that he was going to give the crowd a thrill by doing a hand-stand and a fake fall from one of the planes.

He explained to me that he would go out on one of the wings at an altitude of eight hundred to one thousand feet, stand on his hands, and then apparently fall off; but because of a rope which was attached at one end to a strut of the plane and at the other end to a stout leather harness which he wore, he would fall only about forty feet. By the aid of knots which he had tied in the rope he would climb back up the rope onto the wing—and the joke would be on the ever credulous public.

I cautioned him that I had my doubts as to his being able to climb back up the rope onto the plane because of the windage, which was an added dangerous hazard; but he laughed and said that his profession as steeple jack precluded probability of danger, and showed me the well developed muscles of his hands and arms to bear out his statement.

It was well toward the end of the day when it was announced that this spectacular event was about to take place. All went as per schedule with the hand-stand; then the exclamations of the crowd told all too well of the horror that was felt with the consciousness that a man had fallen from the plane; and sighs of relief could be heard on every hand when he was discovered hanging by the rope from the plane.

As time went on and he continued to dangle there and the plane from which he was hanging continued to circle and circle, we all began to realize that something was wrong!

Gradually it dawned on those of us experienced in active flying that here was a situation demanding the utmost

(*Continued on page* 49)

Experimental Crack-Ups

For once, violent destruction leads to safety. The valuable lessons learned through these unusual and spectacular tests have greatly lessened aviation's accident problem.

by MAJOR FALK HARMEL

Above, the slow motion version of what actually happens when an airplane crashes at top speed and catches fire. Right, the cameraman is photographing the same scene.

SOME years ago at the Army Air Corps Experimental Engineering Division at Dayton, Ohio, extensive experiments were conducted to determine just what did cause fires in major airplane crashes. Old airplanes which had outlived their usefulness were shipped to that Division and there sacrificed on the altar of knowledge.

This altar was a steep runway built out on the flying field and a thick concrete wall at the terminus thereof. The old war horses, minus their wings, were placed at the start of the runway for the joy ride down the incline to destruction. These planes were of all types, as were their motors, which were run up to maximum speed until they had reached an average operating temperature.

At this point, with their propellers still whirling and their throttles wide open, these relics were allowed to plunge down the incline to the inevitable crash against the concrete wall. Alongside the wall were several automatically operated motion picture cameras, among them a slow motion type.

"R-r-r-r-r— Crash!"

Some of these planes caught fire immediately, while others, although smashed to kindling, escaped the flames. The motion picture films solved the mystery as to why some planes caught fire and others did not. Exhibition of the slow motion films revealed the fact that ignition sparks had nothing to do with causing fire, but rather the gas thrown from a ruptured gas tank which was sprayed on the hot exhaust manifold.

It was learned that only those planes equipped with motors having large exhaust manifolds caught fire when they crashed. The slow motion films disclosed a shower of gas and then, as it descended, a tiny white spot which grew to a flare of smoke as the gas spread on the hot metal of the manifold.

EACH year several very important pies are baked and already cut up into irregular wedges, are distributed to an interested public. The Aeronautics Branch of the Department of Commerce bakes one pie, the Army Air Corps another, and the Bureau of Aeronautics, Navy Department, a third. These pies are labeled "Aircraft accidents," and are a graphic representation of the causes, by percentages, of the accidents to the aircraft under the jurisdiction of the government bureaus above named. Invariably, the largest wedge, that of "Personal Errors," takes up over 50 per cent of the total.

While the accident rate is decreasing steadily each year, it is surprising how little variation there is in the various causes of accidents as related to each other. This indicates that both the personnel handling the airplane and the materiel comprising its make-up, also that of its power plant, are improving at almost an equal pace.

Just as better methods employed in flying training and proper supervision of flying activities have tended to reduce the accident rate per flying hours, so have superior equipment and methods of maintenance served to cause a like drop in accidents which might be laid at the door of "failure of equipment." In other words, to err is human, but equipment should be perfect.

As custodian of the records of the Caterpillar Club, that mythical brotherhood of airmen who leaped to safety from airplanes during flight through dire necessity, I have learned many interesting things about aircraft accidents. The causes of the incipient accidents leading to these many jumps have been so varied that it is only possible to classify them into certain groups, study each group and then see what has actually been done to reduce the frequency of accidents in this group to such an extent that life insurance

actuaries will eventually show better longevity rates for pilots than for the man on the ground.

This last is no sensational statement. It is perfectly possible that, with the development of safety in flight, a group

Here is a close-up of what is left of a plane after undergoing the crash test. The smoldering remains are blanketed with extinguishing compound.

of experienced flyers will live longer than the average male who ekes out his living at sea level. The reason for this is the rigid physical examination required of prospective pilots before their acceptance in the Army, Navy or Marine aviation, or before they are qualified by the Aeronautics Branch of the Department of Commerce. They are therefore segregated as a group, all of whose members are at the start in good physical condition.

Such pilots who have had from 600 to 800 hours in the air rarely have accidents. They have passed through certain experiences which have taught them certain lessons. They are the ones who have had the quick wit and flying skill to extricate themselves from tight situations in their first few years in the air.

Let me describe, however, the actual inventions or the actual methods of operation and handling large numbers of airplanes which have resulted in this gratifying slump in fatality rates.

It may appear inconsistent to touch first upon fire hazards, for these have almost been eliminated, and fires in the air, compared to other types of accidents, are becoming fewer each year.

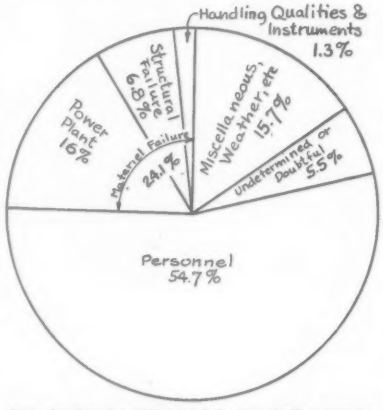
Yet the cry *fire* creates such a stark feeling of horror that its entire elimination from the realm of aviation would be noted with considerable relief by the flying fraternity.

Within a few months following these crash tests at Dayton, all aircraft motors in the Air Corps were equipped with short stack exhaust pipes so constructed as to permit them to be continually cooled through the passage of air about them. These replaced the larger and heavier manifolds which held the heat and presented a continual fire hazard.

However, experienced newspapermen covering aviation activities still take as straight stuff the statement that "Pilot Nittiwitt, who witnessed the accident, stated that the deceased had shown rare presence of mind in cutting out the ignition switch just before crashing, thus preventing a fire."

"If I had only known," sighed a flat-nosed pilot, as he viewed the exhibition of movies taken of the crash tests at Dayton. "Fifteen hundred feet over the woods, and my motor started dying. Would I reach the pasture two miles beyond? A bare chance. We didn't have 'chutes in those days, so all I could do was to sit tight. Maybe the motor would catch and drag me along, so I kept the switch on until the last moment, that being just as we settled into the branches of a tree on the edge of the woods.

"With one hand on the stick, I jockeyed her down in a neat pancake. The other hand darted forward to cut the switch. Why? To avoid fire, of course. That's how it was done in the good ol' days. That one hand should have been clutching the cowling, the forearm protecting my face from harm and hurt.



This is the "accident pie" for civil aeronautics from January 1, 1927 to June 30, 1930. It shows the causes of accidents by percentages.

"For a year my face was a facsimile of instrument readings on the board when we crashed—'Pioneer Compass Co.' across my nose, 'Oil Pressure—0' on one cheek. 'Temp. 80° C.' on the other, '700 R.P.M.' on my forehead. Oh, well, 'Live and learn,'" he concluded.

Another experiment in connection with the elimination of fire hazards centered on the gas tank itself. Practically all military service type planes, and many commercial ones similarly designed, now have a releasing gear whereby the pilot may drop off the plane's auxiliary or "belly" tank, also a dump valve to enable him to release the gas contained in the main supply tank. Draining the gas supply is usually resorted to in cases where the pilot foresees that a forced landing is likely to result in a crash.

In time of war it is quite certain that gas tanks of all military planes will be covered with several sheets of rubberized fabric, so that a bullet entering the tank would leave but a temporary hole in the fabric covering, this material immediately stretching in different direction, thus covering the hole made through the metal of the tank and once more rendering it leak-proof.

Magnetoes have contributed their share to fires in the air when sprayed by gas from a ruptured feed line. Of late years, however, they have all been equiped with fire caps over the commutators, and through these caps no gas can reach to unite with the ever present sparks from the brushes.

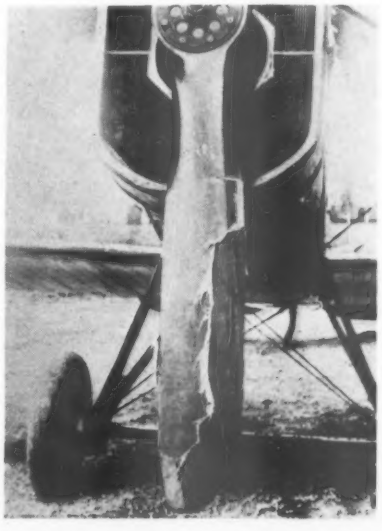
In most planes fuse boxes for the ignition, generating and lighting systems are now accessible to the pilot or one of the crew of the plane, thus tending to lessen the hazard from burning ignition in case of short circuits.

Fireproof fabric has always received attention from those engaged in experimental work in connection with elimination of fire hazards. Its utility, however, is questionable. The flames which cause most of the damage are those emanating from the gasoline in and around the gas tanks and gas lines.

In very large planes, however, burning fabric might cause the complete consumption of the plane, especially where the fire had originated somewhere on the fabric and spread to the wood veneering sometimes used in the interior construction of the cabin. The so-called all-metal planes remove such hazard to a great degree, of couse, but soap and water is now generally used instead of gasoline to wash down an airplane. Soap and water are not so apt to explode.

Many fires have originated from the back firing of the motor through the carburetor, causing the ignition of gas inside of the carburetor ducts. A fine wire gauze now covers the air intake from most carburetors, and this air intake is led outside the cowling of the motor, thus preventing the contact of a spark with any gaseous vapor which might be inside the cowling and around the motor.

(*Continued on page* 58)



A wooden propeller, much the worse for wear and tear after a five hour trip through rain.

Curtiss - Wright Crash Results in $100,000 Lawsuit

A $100,000 personal injury suit against the Curtiss-Wright Flying Service, Inc., has been instituted in Chicago by Mrs. Louise McCusker. The verdict may determine the extent to which a commercial flying service is financially responsible for injuries sustained by passengers.

On the night of May 22, 1930, Mrs. McCusker was a passenger in a Curtiss-Wright cabin plane flying from Glenview, Illinois to Valdosta, Georgia. Harold Mayer of the Curtiss-Wright staff was pilot. Dr. J. Frederick Harvey of Chicago was another passenger. Mrs. McCusker was hastening to the bedside of her mother, who had been fatally injured in an automobile accident.

Flying low during a terrific storm, the plane hit a tree near Waynetown, Indiana, and Pilot Mayer was killed. Mrs. McCusker was hurled against the cabin, sustaining several broken bones and a severe cut on her right leg. She was badly bruised and, according to her suit, was under the care of physicians for a long time, paying more than $1,000 for their services.

It was Mrs. McCusker's contention that the crash was due to negligence and carelessness on the part of the Curtiss-Wright pilot. This was denied by the Curtiss-Wright corporation.

The case was tried in Chicago, April 30, 1931, before Judge David M. Brothers of the circuit court, and resulted in a hung jury after eight hours' deliberation and about 100 ballots, the poll of jurors standing six to six. Judge Brothers thereupon dismissed the case, and ordered a new trial to start June 22.

Doctor Harvey, the other passenger, who also was injured, has a similar suit for $50,000 pending in the superior court, but his action is based more directly upon the responsibility of the carrier than upon the pilot's behavior.

The judge's instructions to the jury stated plainly that the burden was clearly thrown upon Mrs. McCusker to prove negligence on the part of the Curtiss-Wright pilot. As a result of the deadlock, the conclusion is inevitable that at least six of the jurors felt she had established her case.

Hundreds Seek Air Scholarships

MORE than 400 college men will compete this year for the annual W. E. Boeing Scholarships, awarded to the successful candidates whose eligibility is determined by physical and scholastic rating.

The scholarships in the Boeing School of Aeronautics have a tuition value of $7,375, the major prize being the Boeing Master Pilot course with 204 hours of flying and 924 hours of ground school instruction in twenty-three subjects.

Latest Arrow Sport Has New Refinements

AN EXCEPTIONALLY high degree of stability is claimed for the Arrow Sport "85," manufactured by the Arrow Aircraft & Motors Corporation, which recently received its Department of Commerce approval. The new model is powered by the LeBlond 85 hp. motor and is priced at $2,985.00.

The greater stability secured over previous Arrow models was obtained by giving the lower wing a 4 degree dihedral and improving the design of the tail-group.

A new type of landing gear has been provided. This includes Goodrich semi-balloon tires and a built-in braking system manufactured by the Aircraft Products Corp. The semi-balloons, coupled with an efficient shock-absorber unit in the compression struts, iron out rough landings exceptionally well.

The gas tank is in the upper wing and carries 22 gallons. Consumption averages 5 gallons per hour, this giving a cruising time of four hours on filling of the gas tank, with a 2 gallon reserve.

Specifications

Span, top wing	25 ft. 10 in.
Span, lower wing	25 ft. 4 in.
Stagger	24 in.
Length overall	20 ft.
Height	7 ft. 9 in.
Weight, empty	93 lbs.
Gross weight, loaded	1,440 lbs.
Useful load	507 lbs.
Top speed	100 mph.
Cruising speed	85 mph.
Take-off	300 ft.
Landing speed	42 mph.
Climb	485 ft.per min.
Absolute ceiling	16,000 ft.
Service ceiling	14,000 ft.

The Arrow Sport "85" shown in these two views is a two-place, side-by-side plane. Modifications in the wing and tail-group design have increased the stability of the 1931 model.

Gliders Often Fool Experienced Pilots

PACIFIC Coast Gliders, Ltd., have been operating a glider training school for over a year without even an approach to a crack-up. The nearest approach they have had to an accident was when in the earlier stages of their experience they were willing to accept the statement that because a man is a licensed airplane pilot he is able to get into the air with a glider without any training. In almost every instance pilots are very much hurt when it is suggested to them that it would be well for them to taxi across the field a time or two in order to get the "feel" of the controls.

"We have probably insulted a number of pilots," said D. Martin, manager of the company, "because we insist on this procedure, but we feel our record is proof of our contention."

In support of these statements, it is interesting to note the following from the United States Aviation Underwriters bulletin issued the latter part of 1930:

"Oddly enough," the bulletin states, "the glider people have come to the point where they fear the airplane pilot in a glider more than they fear any other individual who gets into one.

"In many instances they have attempted to fly carelessly and recklessly, and have either disgusted themselves with their performance or have even done so badly that they have wrecked the other fellow's ship, and in some instances have killed themselves.

"Most of those killed in gliders in the United States during the past year were airplane pilots.

"In many instances pilots do not come to grief during the first few flights, and get to the point where the glider fools them. Unlike the student who has a real respect for the glider, the airplane pilots seem to hold the mistaken idea that it is something to be treated carelessly and almost with contempt.

"Captain Hawks started out as a novice for some time. Eddie Stinson has flown as a novice and has got along very nicely as the result of it. In fact, experienced airplane pilots who take up gliding as novices quickly master the art, often in two or three flights, and become very much interested in it and believe in it. But those who have undertaken to fly gliders on a parity with veteran glider pilots in almost every instance have come to grief."

How to Build the "Whining Bullet"

If you have an old model, why not try this interesting experiment?

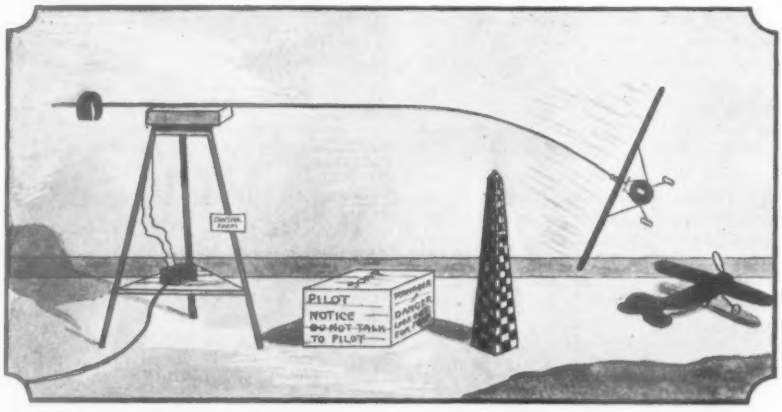
by BENJAMIN SMITH

DO YOU rebuild and rebuild your wrecked models? It's a poor practise. Why not turn your old scale model into this realistic plane, "The Whining Bullet"?

With a smaller propeller and a whining, roaring motor it looks and sounds the real thing. What a whale of a difference a scale size propeller and a little noise makes!

A miniature electric motor such as is used in toy construction sets is the motive power. In order not to greatly disturb the adjustment and balance of the plane, it is advisable to place the motor at the center of gravity. To do this and to enclose the motor, cut the fuselage in two and then mount the motor on a piece of white pine or similar wood 3/16" thick and as wide as the inside dimensions of the fuselage. The engine is held to this piece by small bolts and nuts. The motor mount is then slipped inside the front section of the fuselage and a small hole is drilled in the nose for the bearing of the propeller extension shaft.

It is necessary to have the propeller shaft absolutely straight, otherwise excess vibration will be noticed. In connecting the extension to the motor shaft, an erector coupling can be used. A piece of tubing or a small bushing



Elmer Adair, M. Brooks and the author built this racer from an old Curtiss Hawk scale model. It was successful in every respect but they couldn't let it alone and finally burned out the motor when they tried to "rev it up" with higher voltage.

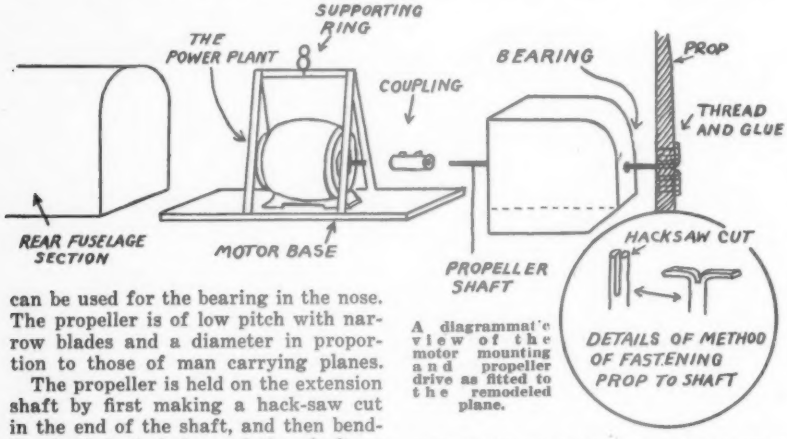
can be used for the bearing in the nose. The propeller is of low pitch with narrow blades and a diameter in proportion to those of man carrying planes.

The propeller is held on the extension shaft by first making a hack-saw cut in the end of the shaft, and then bending back both halves of the shaft as you would a cotter pin. Thread is lashed around propeller and shaft and then glued.

The "Whining Bullet" is not stationary by any means. It will actually take off under its own power and do nearly vertical banks at high speed. Of course, this model doesn't really fly, but it certainly looks like flying.

As you see by the drawings the model is swung and supported in the air by a turntable. It is connected to the turntable by a hook and two metal rings, which in turn, are fastened to the model by means of a triangular wood frame built on the motor mount. The drawings show the method of construction of this frame and the method of fastening the wing and the rings to it.

The wires from the motor lead up to the rings either through the cockpit or straight up through the wing. Then if the motor runs all right put the rear fuselage section on the motor mount and completely inclose the motor with exception of cooling vents. These vents are not necessary if the nose of the model is open. It is also advisable to



A diagrammatic view of the motor mounting and propeller drive as fitted to the remodeled plane.

protect the model from electrical sparks from the brushes of the motor. Thin wood, tin or cardboard will do this.

The wing or wings may be strengthened by additional spars and struts. This depends upon the type of model used. When supported by the rings the model should be a trifle tailheavy. Final adjustments can be made with elevators or rudder as the rudder acts as an elevator on steep banks, or a weight may be added to nose or tail as the case may be.

So much for the model, now for the turntable. The stand which supports the turntable is made of three pieces ½"x1" and about four feet long. These are the legs. At about the middle of the stand is a triangular shelf which will support the transformer or dry cells. The top of the stand is made of a piece of two by four, six inches long.

The turntable arm is made of a length of ½"x1", some umbrella ribs and a six inch piece of two by four. Any flexible metal rod can be used instead of the umbrella ribs, as an old metal fish pole. The proper bend and tension of this piece is found by experiment. A hook is soldered on the end of the flexible rod. The various pieces of the turntable can be easily assembled with the exception of the bearings and electrical contacts.

The bearings can be taken from an old motorcycle or bicycle wheel hub, or bolt, some washers and a nut can be used if little friction results. There will be little difficulty in getting the "fuel," or electricity to the "Whining Bullet" if you study the drawings carefully.

One of the connections follows from transformer or batteries up through the bearings and then to the plane. The other connection follows from the transformer up through the brushes to commutator to plane. The first connection is easily done but the second is more difficult.

The brushes are three in number and are made of piano wire. The commutator, which is mounted on the turntable block is made from the top of a tin can with a hole cut from the center.

The commutator and brushes must not come in contact with the bearings.

All three brushes are wired together, and the wire goes down to the transformer. On the turntable block, wires pass through the block from the lower surface to the upper, and then to the motor. This is only to keep wires

(*Continued on page* 49)

Who Owns the Seadromes?

THE question of sovereignty over airports on the high seas and whether they should come under the jurisdiction of the League of Nations was discussed at a recent meeting of the International Aeronautical Juridical Congress at Budapest. This raised an interesting point, as the only definite project of this nature is the Armstrong seadrome, to be built by an American company.

Representatives of twenty-two foreign nations decided that the League should have power of intervention in seadrome affairs. The fact that America is not a member of the League did not enter into the discussion, according to a report of the proceedings published by the Department of Commerce.

The status of a seadrome, if the country operating it goes to war, was also considered. One delegate suggested that seadromes be declared neutral in time of war; another member offered an amendment to the effect that in case the seadrome owner becomes a belligerent, the control of the seadrome should be turned over to a neutral state.

The following resolutions regarding ocean airports were adopted:

"Any airport of the high seas, created for the needs of air navigation, whether it be the property of a private individual or a state, may be established on the high seas only under the authority and responsibility of a state, whether or not the state possesses a seacoast.

"The state, under whose authority this airport of the high seas comes, regulates the conditions of admittance to and use of such airports.

"If the airport on the high seas is open to the public, no discrimination may be made between aircraft on the basis of nationality.

"States must make known reciprocally their intentions to create airports on the high seas.

"In case a delay is caused because some state is opposed to the creation of such airport on the high seas, the dispute shall be carried before the League of Nations which shall settle it.

"If for any reason whatever the League of Nations cannot be advantageously impressed, or if it cannot settle the dispute, the parties will have recourse to obligatory arbitration."

Examine Would-Be Pilots

AUTHORIZED medical examiners of the Aeronautics Branch of the Department of Commerce, on March 31, 1931, had conducted a total of 110,225 physical examinations for Department of Commerce pilot licenses since the organization of the branch in 1926.

Statistics compiled for the three months beginning with January 1 and ending March 31, 1931, show that 8,459 examinations were conducted during this period.

Army Flyers Assemble Complete Map Before Landing

Below, Lieut. George W. Goddard and his assistant exhibit the map of Chicago which they photographed and assembled while in flight. Right, a view of the dark room inside the plane.

SOARING back and forth over Chicago at an altitude of 12,000 feet, Lieut. George W. Goddard of the United States Army Air Corps and an assistant, recently took pictures of the city and its shore line, developed the prints, fitted them together into a mosaic map and landed with the finished picture, all in half an hour. According to army officials the feat marks a triumph in aerial photography and an important development that promises great service in actual military operations.

In war time, for instance, a wide area of enemy territory might be photographed from a flying studio such as this, a map made and marked and then dropped over headquarters, all in an hour or so, saving precious time required to perform such a task by old methods and eliminating much of the danger of failure.

Photographs have been taken and the negatives developed in a plane before, but this is the first time that a complete mosaic map has ever been prepared "on the wing." Improved cameras and other apparatus, fast developers and papers and an efficient dark room, built into the plane's fuselage, coupled with the skill of Lieut. Goddard and his assistants made the feat possible.

This unique flying picture laboratory has been under construction for many months at Chanute Field, Rantoul, Ill., where Lieut. Goddard heads the photography school of the army air corps.

Installing a dark room large enough for the preparation of mosaic maps and for holding quantities of supplies for an extensive expedition, was no easy task, especially in view of the bulk of the cameras and the necessity for having everything so arranged that the photographer would not have to waste value time walking around.

The huge aerial camera is mounted in the floor of the fuselage. Back of the pilot is a twenty-gallon water tank that supplies the developing sinks in the dark room proper which is toward the rear. There are special driers and holders for the plates and prints and tubes with parachutes so that the finished pictures can be placed inside and dropped safely to the ground in case that photographs are delivered enroute.

Aerial photography will have wider application and greater usefulness with the development of the dark room plane. On commercial air mapping expeditions, for instance, the fliers do not know until they return to land and develop their negative whether or not the pictures are successful.

By being able to make the complete prints and maps in the air, failures will be discovered at once, and if necessary, more views can be taken while the weather and other conditions are satisfactory. This will save a costly second trip and the delay that may be necessary in waiting for favorable weather.

Pilot Gets Chummy With Meteorite

A TRANSCONTINENTAL air mail pilot, flying westward from Cheyenne, Wyoming, a few weeks ago, got the scare of his life when a flaming meteorite approached his ship from the south, crossed the path of his plane a short distance ahead of him and exploded in midair with a roar and a rocketlike display.

Describing his encounter with the meteorite, the pilot said his attention was attracted to it by a deafening roar. Turning, he said, he saw a flaming body approaching him. It was not very high, and for a time he believed it might strike him. Light from the plunging body, he said, illuminated the heavens, and when it burst the air was filled with molten particles.

The World's Largest Dirigible

Sidelights on the U. S. S. AKRON

The new pride of the Naval Air Fleet is nearing completion. Here the author gives us a peep behind the scenes on this gigantic project.

by

WALTER E. BURTON

BRIGHT and early some morning this summer the people of northeastern Ohio will be awakened by a strange, roaring noise. Looking into the sky, they will behold an inspiring scene. It will be the U. S. S. AKRON, bright as the eagle on a new silver dollar, venturing out on its maiden flight.

No one knows the exact hour in which the Navy's new 6,500,000-cubic-foot rigid airship will leave the ground for the first time; but certainly it won't be until every detail has been checked, every part inspected and tested, and every other precaution taken to prevent mishap.

Nothing exactly like the AKRON has been built before. It is the largest airship built exclusively for the use of helium gas. For that reason, its design is radical in many respects; and being radical, involves many factors as yet tried only in the laboratory and in the minds of the ship's builders. Nothing is being slighted in the effort to make the ship the safest and most perfect airship so far created.

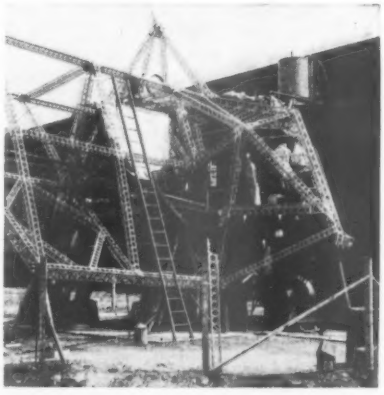
Perhaps by looking into some of the details of the ship and the building operations that are among the less obvious, you can become better acquainted with the character of the new flying scout that will, for a time at least, lead the Navy's lighter-than-air forces . . . witness, as it were, some of the side shows that help make up a much greater attraction.

"Where's that alligator?" you might overhear a workman ask.

But he wasn't referring to an air-minded reptile. He was asking for one of the dozens of type of special hand riveting machines—"squeezers" is the modern term—that are used to press into place the six and a half million duralumin rivets that help hold the 60 tons of duralumin girders together. Some navy men who worked on other airships knew these tools by the name of "pinch bugs," but that title seems to have missed getting to Akron.

The diversity of forms of these squeezers has led to the creation of a new vocabulary descriptive of them. There are "pelicans," "dog legs," "scissors," "plain C," "alligators," and so on. The alligator type has huge, powerful jaws. The dog leg looks like that part of a canine's anatomy. In most cases, the name indicates the shape of the tool.

So unusual are the forms of girder joints and so limited is the space in which a squeezer usually is employed, that the builders found it necessary to manufacture their own riveting tools. In a fair-sized shop at the side of the airship dock, blacksmiths and machinists worked for months, producing special squeezers. When a workman found that none of the riveting tools at hand would reach some out-of-the-way corner, he drew a rough sketch of the situation, perhaps even designed a template, and turned the information over to the machine shop.



Testing one of the Maybach motors and its propeller driving mechanism in a full scale duplicate of one of the engine rooms.

Eventually a new squeezer, waiting for a brand new name, was born. It has been estimated that about one thousand riveting machines were made for the AKRON, and that the average cost was $30, making a total of $30,000 spent for these tools alone. That's one reason why the airship-building business is no pigmy affair.

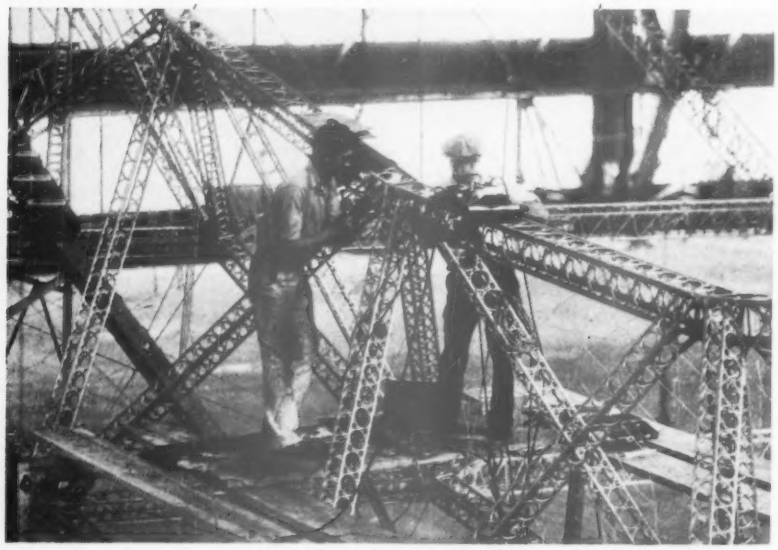
The duralumin-girder hull of the AKRON is laced together by some 2,000 miles of steel wire. Each piece of this wire is put under a tension before the ends are wrapped and soldered. Now, the stretching of a length of steel wire is not always an easy matter, as everyone who has helped build a wire fence knows. And there are quite a number of stretches in 2,000 miles of airship bracing.

At first, a rather complicated wire tightener that looks like a cross between a wheel-puller and a katydid, was developed. It fastened to the wire by means of clamping screws. Soon, however, it was discovered that the clamps were inclined to slip, scraping the galvanizing coating from the wires, and otherwise spoiling the stretching operation. So the airship builders got busy again and turned out a really adequate device. The workmen promptly dubbed it a "come-along," because it causes the wire to do exactly that.

The come-along is a flat piece of metal somewhat like a flattened shoe horn, and with a toothed wheel at one end. A smaller gear engages this wheel. In use, the end of the device opposite the gears is soldered to the wire to be stretched, at some point a yard or so from the end.

The free end of the wire, that projecting from the hole in the girder, is attached to the large wheel, the small one is turned by means of a pin inserted through a hole in its shaft, and the come-along "walks" along the wire,

Two of the skilled workers putting the finishing touches on one of the joints in the main frame.

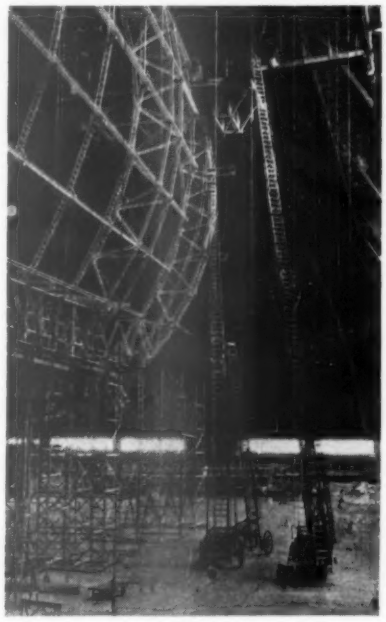


drawing it to the desired tension. Then the end is wrapped to the main part with smaller wire and the joint soldered, and excess wire is cut off after inspection.

Before being used, all wire is straightened so it will not curl and tear adjacent fabric if it breaks.

A GROMMET is "a hole that fits inside another hole" so as to make the edges stronger and less sharp. In reality, it is a ring-like gadget that is clamped into a girder hole by screwing. Then, when a bracing wire is passed through it, there is something definite for the wire to hold.

Early in the construction of the AKRON it was found that the wrenches



These giant extension ladders afford a means of reaching the points not accessible to electric cranes or working platforms.

provided for fastening grommets in place were far from perfect. Workmen lost valuable time in adjusting and using them, and did not always do a perfect job. So it was necessary to perform another of the numerous side-plays.

Eventually a grommet wrench was developed that is simplicity itself. It consists of a handle and a loop of tough, flexible material that wraps around the grommet and holds tightly when the handle is pulled around. This wrench resembles those employed for opening fruit jars or taking off automobile hub caps.

It is, of course, necessary to prepare cooked food for the crew of an airship. Although cabins and other parts of the AKRON are to be heated with hot air piped from the engines, this is not sufficient for cooking. So it became necessary to provide some form of concentrated, light and efficient stove.

Long before the airship was nearing completion, the problem had been solved. In fact, one of the naval inspectors stationed at the Akron airship dock, solved it a few years ago. Stoves used on the LOS ANGELES had been criticized for various reasons. So this particular naval airman set about producing a better one.

He obtained a standard cast-iron stove and employed it as a general guide. He prepared plans for an improved type having aluminum-alloy parts instead of iron. Such a stove was built. Eventually it was found that certain liquid fuels give off objectionable fumes, so finally a fuel gas that comes in steel bottles was selected. That is the combination that will be used on the AKRON—bottled gas and a light-weight stove. Consequently, the crew will not lack hot soup, steaming beans and coffee, even on the coldest flights.

This idea of light-weight equipment is carried throughout the airship for, after all, the useful load a displacement type of aircraft can carry is equal to the weight of the air displaced minus the weight of the ship itself.

Cooking utensils other than stoves will be of aluminum. Meals will be served on paper plates, and coffee, milk and other liquid foods will come to the mess tables in paper cups. Then, after use, these can be destroyed, making life easier for the cooks.

Well forward on the port side, above the control car, will be the ship's office. Here the yeoman will conduct the business affairs of the flying fortress. He will keep his records in filing cabinets, made, not of steeel, but of aluminum-alloy. Even the typewriters will be specially built with cast-aluminum frames and other parts of the same metal. Chairs, beds, desks and every other possible article will be made light in weight.

Deck floors in rooms and gangways of the ship are constructed on the order of a four-layer sandwich. First, at the bottom, is a layer of thin duralumin, then a one-inch sheet of balsa wood, the lightest natural wood known; then another sheet of duralumin, and finally a layer of shellacked cork.

The question has been asked whether the sudden departure or hooking-on of airplanes will affect the ship's stability. The AKRON will carry, in a hangar built into one of the largest bays or sections between main frames, five fast observation and fighting planes. These will be launched and taken aboard by means of a trapeze operating through an opening in the bottom of the hull.

Each plane, of course, weighs several thousand pounds, and the pilot 150 to 200 more. Such a weight, it would seem, would affect the ship's lift when suddenly released or attached. But the designers have assured the curious that the planes will have almost no noticeable affect in coming or going.

This is because the AKRON and its sister ship, the unnamed ZRS-5, will have 15 tons leeway in dynamic lift. This means that the weight of the craft

(*Continued on page* 56)

Blue Is Best Color for Planes

WHAT is the most conspicuous color for airplanes? To solve this problem, a Pittsburgh glass company constructed a room fifty-five feet square and fifteen feet high, equipped it with various kinds of lights, and with apparatus to fill it with steam, smoke and aqueous vapor so as to simulate artificially all weather conditions from a thunderstorm to a dense fog.

Model planes, painted in different colors, were placed in the chamber, and viewed under fifteen different made-to-order weather conditions. The conclusions arrived at were that a pilot in flight can best see another airplane, in solid color, if it is painted a dark blue. The next best colors for greatest average visibility take the following order: chrome yellow, orange, red and green.

Light blues and grays are very hard to distinguish in the air, and aluminum paint has the poorest visibility of all, because of its tendency to reflect all colors and thus to merge into the surrounding air. Yellow and red proved a good two-color combination for all-round visibility.

AKRON to Use Portable Mast

A NEW portable mooring mast which steers like a tricycle and travels on caterpillar legs and weighs 200 tons is ready for tests of the new navy dirigible which will soon be completed at Akron, Ohio.

This new mast is 76 feet high and has three caterpillar legs, two of which are power units and the third is steerable.

The mast, which is called "the iron horse," has a self-contained power unit of 225 horse-power. A gasoline engine drives a generator for the electric power. One motor operates both caterpillar drives through a differential similar to the one on an automobile.

This new mast is large enough to be used by any dirigible which will be con-

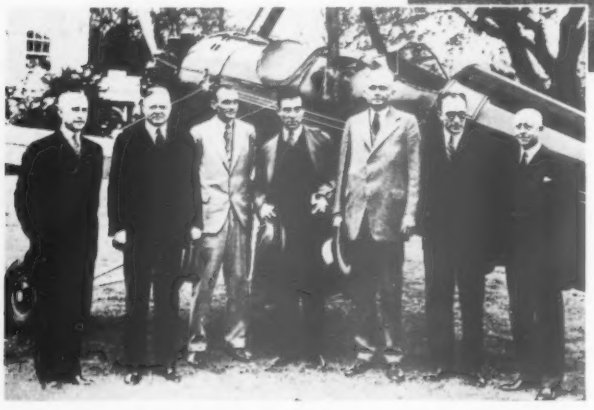
Six men can moor the largest dirigible with this "iron horse."

structed over a period of ten years. The largest of the airships can be moored with ease, with a personnel of about six men. This is in contrast with the two to three hundred men ordinarily required to moor an airship.

Pitcairn Receives the Collier Trophy from President Hoover

FOLLOWING a custom long honored by the nation's chief executives, President Hoover on behalf of the National Aeronautic Association presented the Collier Trophy for 1930, the highest award in American aviation, to Harold F. Pitcairn and his associates for "their development and application of the autogiro and the demonstration of its possibilities with a view to its use for safe aerial transport."

The presentation ceremony took place at the White House at 12 o'clock noon, April 22. This coveted trophy is awarded annually by the National Aeronautic Association "for the greatest achievement in aviation in America, the value of which has been demonstrated by actual use during the preceding year."



Above, James Ray about to land his autogiro on the White House lawn. Left, just before the presentation ceremony we see left to right: Orville Wright, President Hoover, James Ray, Clarence Young, Hiram Bingham, Harold F. Pitcairn and Chas. Francis Adams.

In making the presentation, Senator Bingham, president of the National Aeronautic Association, opened the ceremony by explaining the history and status of this award. President Hoover then cited the 1930 award and made formal presentation to Harold Pitcairn of the trophy, a sculptured group in bronze symbolizing the spirit of flight. Mr. Pitcairn accepted in a brief speech.

In connection with the presentation a remarkable demonstration of the unique flying performance of the autogiro took place. James G. Ray, vice-president and test pilot of the Autogiro Company, landed an autogiro on the south lawn of the White House grounds. He then taxied the autogiro to the steps of the White House portico where it remained until the presentation ceremony in order that President Hoover could personally examine this unusual machine.

How to Behave at a Crack-Up Party

by DOC SCHNURMACHER

UP to the present time, Vance Breese's principal claim to distinction was the fact that when a motor had dropped through the bottom of his plane over Los Angeles, he had made his passengers come up forward, and by thus shifting their weight to the nose of the ship, he had brought her down without a crack-up.

Now, however, it looked a great deal as if the resourceful Mr. Breese was going to smear his low-winged monoplane all over North Beach. Students at the field were offering odds of three to one on that prospect, with no takers. Mr. Breese was mighty anxious to put his ship down at Glenn Curtiss Airport, but his retractable wheels were jammed and would not go either up or down!

Near the hangars, Sales Manager Capehart had been working mighty hard on an airplane prospect. Hard, because prospects right now are scarce as hen's teeth. Just as he finished pointing out the trim lines of the plane he was demonstrating, and was hoping that the prospect would reach for his check-book, there was a great to-do at the hangars and the fire truck dashed wildly towards the middle of the field.

"What's the commotion?" asked the prospect.

"Oh," said Capehart nonchalantly, "weekly fire drill, you know. Now take the motor for example. It . . ."

At this point, with a great deal of enthusiastic clanging, the ambulance dashed out, following the exhaust of the fire truck. The boys were intent on giving Mr. Breese every consideration.

(*Continued on page* 55)

Lindbergh Has His Limitations

THERE aren't many fliers who can do things with an airplane that Col. Charles A. Lindbergh can't do, but David S. Ingalls, assistant secretary of the navy in charge of aeronautics, is one of them. Ingalls can land on the deck of a navy aircraft carrier, and Lindbergh can't.

Why?

"Lindbergh can't because I won't let him—not as long as I am assistant secretary of the navy," Ingalls chuckled to a friend the other day.

California Governor Wants to Fly

GOV. JAMES ROLPH, JR., of California is air-minded. He just asked the state legislature to appropriate $150,000 for the purchase of three airplanes for the use of the governor and departments of the state.

Gov. Rolph, who only recently took office, credits his election to the use of airplanes during his campaign, which enabled him to visit every corner of the state in limited time.

Scientist Chases Silver Linings

A NEW kind of meteorology was described recently by Dr. J. B. Anderson of the Naval Air station at Anacostia, D. C., who chased clouds in an airplane to learn how fast they grow. He especially wanted to know something about the clouds in the permanent layer that hangs over the Pacific coast, so he went up among them in his plane.

To illustrate how they pile up, he said that to keep even with the top of one cloud he was studying he had to climb 200 or 300 feet a minute.

Second Hand Plane Toes Line With Autos

THE second-hand autos and tractors found a strange craft in their midst last week when the owner of this plane, deciding to sell it, placed it in a second-hand auto lot on a busy street in Detroit.

Wonder what the auto salesman will tell the prospective customer when he asks for the R.P.M. of the ship's propeller or what mileage it gets on tires!

A Tribute to Speed Holman

An intimate biographical sketch of a famous pilot and flying executive whose name was a by-word wherever races were held.

by GEORGE SMEDAL

IF YOU will just think back a few months you'll remember that a chap by the name of Speed Holman won the 1930 Thompson Trophy race, twenty laps of a five-mile course, averaging 201.91 miles per hour for the one hundred mile stretch. The race carries with it, besides the valuable trophy, $5,000 in cash. Holman won the race, but he didn't collect the five thousand.

Speed piloted a plane in that race just for the fun of flying, it being stipulated before the race that if he should win, the $5,000 would not be his. Imagine being so much in love with flying that one is willing to cut corners in a new and heretofore untried plane at more than 200 miles an hour just for the adventure of it! Holman did and that's the index to Speed Holman of Minneapolis.

Let's go back to the air race.

E. M. Laird, builder of the famous Laird planes, tells us that a tire company placed an order with him for one of his special speed wing planes three weeks before the race. Although handicapped by the short time in which to compete against the nation's fastest, the Laird organization worked day and night to complete the craft. At 3:30 p. m. of the day of the Thompson Trophy race the plane was wheeled out of the factory. The engine was started on a field near the factory and Speed Holman, who was in the pilot's cockpit behind the 300-horsepower motor nodded, the chocks were pulled and into the air went the plane on its first test flight.

Ten minutes after flying the speedy craft, Holman set her down, and with the comment, "She's fast," he gave orders for a few minor adjustments. The tanks were to be filled and there was just about time enough to hop over the field for the big race.

If you could have stood beside Holman you would have realized how anxious he was to fly that plane in the race. It had been planned to let another nationally known pilot fly the craft. Some of Speed's friends got this pilot off in a corner and a hurried consultation took place. They urged upon this pilot to let Holman fly the craft. They pointed out that Holman had been around this course in other races of the week; they told how Holman's fastest plane was a Laird and how many of them he had flown. Holman had won many a race in the Laird planes of other years. His personal ship is a Laird craft. After much persuasion the pilot assented and when he was told, Holman acted like a school boy. He jumped and pranced around the craft and hurried the mechanics. He hopped over to the Curtiss-Reynolds airport and thirty minutes later he was piloting the craft to victory, establishing a new closed course record for commercial ships.

December 27, 1898
CHARLES W. HOLMAN
May 17, 1931

One of the foremost figures in the ranks of America's distinguished pilots, Holman's tragic death at the Omaha races came as a shock to the entire world of aviation.

The accompanying article was prepared some time prior to the fatal accident and is being published without change as perhaps the finest tribute we can pay to a man who will live long in the memories of flyers.

During that race Holman was twice on the verge of losing consciousness. Exhaust gas, driven into the cockpit of the tiny racer, threatened to put him out. Cutting the corners at more than 200 miles an hour drove the blood from his head, leaving him weak and dizzy.

After the race he disclosed that once he came to just in time to see a big tree looming in front of him. He jerked back on the stick, instinctively, and got over the obstacle. At another point in the race he nearly ran into a railroad block signal. Again, instinct saved him.

The tension of the race showed plainly as Speed tumbled out of the craft. He dropped to the ground on his hands and knees. He was sick. An ordinary flier might never have come out of that cockpit alive. But then Holman is no ordinary man or flier.

FUNNY as it may seem Speed Holman did not gain his nickname as an airplane pilot. His full and business name is Charles W. Holman. It was in 1917 that he owned his first motorcycle. He liked speed so he raced at the Minnesota state fair grounds. It was there that his old nickname of "Slim" was replaced by "Speed" and today Speed Holman is known nationally as one of the most expert, fastest and safest airplane pilots.

It was in 1917 that Speed tried to get into the aviation service of the United States. But he failed. There was something the matter, not a serious defect but enough to have the recruiting officers turn him down. They considered him too young.

Holman has always loved motors. He is perhaps the most expert engine mechanic in aviation. That's why he wanted to get into the army aviation. It gave him the opportunity of being with airplanes and motors and it would also give him a chance to learn to pilot an airplane. But the air service said *no*, and Speed was terribly disappointed.

It was about a year later that Holman got his opportunity. Walter Bullock, one of the pioneer aviators in Minnesota, now a pilot with Northwest Airways, bought a biplane of the pusher type. Holman didn't know Bullock but watched one of his exhibition flights. That night Holman wrote Bullock a letter explaining that he wanted to learn to fly and was willing to work as a mechanic in exchange for the chance to learn flying. Then followed an introduction and the result was that Holman got a job with Bullock. He met other fliers, learned the rudiments of flying.

Then Holman decided he needed some more money. Parachute jumping was quite the fad then so Speed decided it was a quick way to earn the necessary funds. So he started wing walking acrobatics and all kinds of stunts.

In the meantime Holman's father learned of these tricks. He was plainly worried. He offered to get his son a plane if he would just stop parachute jumping and all those other crazy tricks.

Of course Speed was agreeable so in the fall of 1920 Holman had his ship.

Soon afterwards, a student pilot was in the cockpit while Holman was starting the motor outside. The student decided he knew something about flying so he tried to take off in Speed's plane. He piloted it into a nice mess of wreckage and that was the end of Speed Holman's airplane. A more heartbroken youth never lived.

But the next spring Holman was again flying. He carried passengers in order to pay his father back for the airplane. During the next two

Matty Laird, designer, and Speed Holman (right), formed a racing team that was hard to beat.

years the youthful flier served as chief pilot for an aircraft company and a school of aviation.

In 1924 Speed had his first taste of cross-country flying winning second place in the "On-to-Dayton" race from Minot, N. D.

Then followed two years of exhibition flying and it was during this time that Holman began to distinguish himself as a stunter. But always he was the skilled pilot, competent and trustworthy.

In 1926 he took to flying the air mail and also continued his exhibition flying. He spent hours in the air perfecting his stunts and learning what a plane would safely do and would not do.

In 1927 he won the Class A National Air Derby from New York to Spokane and soon afterward came in first in the Spokane to Portland, Oregon, classic. In the fall of that year he became operations manager of the Northwest Airways, which position he still holds. But Holman did not quit flying. He has never flown more than since he got his present position.

I REMEMBER that in 1928 looping-the-loop was just as much of a rage as endurance flying was last summer. One Sunday afternoon I watched Holman looping out at Wold-Chamberlain airport near Minneapolis. When he landed he had made 1,093 loops, a new record. A few days later we heard that a French flier had broken Speed's record. He immediately climbed into his craft and when he landed he had made 1,433 loops which is still the record.

Speed likes cross-country racing. In 1928 a forced landing in a fog set him down near Pittsburgh on the New York to Los Angeles race. Somebody erred in starting the fliers. They hit fog a short distance out of New York. Holman repaired his plane, flew to Los Angeles and the day after his arrival won the race to Cincinnati.

Remember Memorial day, 1929? Holman, at an average speed of 157 miles an hour, won the race over the St. Louis to Indianapolis course. He got the Gardner trophy cup and $6,250 first prize money. Holman is also credited with making the first outside loop in a commercial plane at Wold-Chamberlain field, April 10, 1929.

If you attended the national air races in Cleveland two years ago you remember seeing a sixteen passenger tri-motored plane flying up side down. It was the first time that this had been done and if you had been sitting beside me I could have told you that Speed Holman was the pilot.

Do you wonder what Holman thinks of stunt flying? He frankly admits the risks he takes in stunting a plane but he resents the intimation that he is more reckless than the average pilot. He never puts a plane through more than it can stand. And stunting, he explains, is valuable both as training for a pilot and in locating the weak points in airplane construction.

Ask him about this and he'll reply: "The stunt flier has had his plane in every position that it can get into in case of accident. The pilot who knows how to take his plane out of a stunt spin or drop, knows what to do in case of real emergency."

A little more than a year ago Speed Holman joined the caterpillar club. He was testing a new ship over Wold-Chamberlain field. It failed to respond to the controls and after sticking with it as long as he dared Holman took to his chute. His recommendations as to construction changes resulted in this plane later winning a certificate from the U. S. Department of Commerce.

Everybody likes Speed Holman. He is very modest, almost bashful. He is six feet, five and one-half inches tall and this frame is covered with 215 pounds of muscle. There isn't an ounce of fat on his tall lean body. He's as trim as the planes he flies. He moves fast and the only thing he'll talk about is flying.

Flying is safe, Speed says.

"It's like any other form of transportation. You have a good machine, knowledge of the conditions you are to travel under and the ability to handle the craft."

Before citing just a few of Speed Holman's records let me explain that he is still setting them. Recently he flew into Chicago from Minneapolis, Minn., in 100 minutes! If you don't think that fast, it means that he traveled 360 miles in one hour and forty minutes. His previous record was eight minutes slower.

So next time you hear or read about a record breaking flier just think of these, just a few of Speed Holman's records:

1923—Won stunt flying contest at Pulitzer race in St. Louis.

1924—Took second place in "On-to-Dayton" race, Minot, N. D. to Dayton, Ohio.

1927—Won National Air Derby, New York to Spokane, 19 hours and 42 minutes.

1927—Won Spokane to Portland race by 27 seconds over second prize winner.

1928—Established world's record of 1,433 consecutive loops in five hours. This is still the record.

1928—Won Los Angeles to Cincinnati air race.

1929—Established air mail speed record for commercial planes over Minneapolis to Chicago route, 360 miles in one hour, 48 minutes.

1929—Piloted first commercial plane ever to make outside loop. Did it ten times.

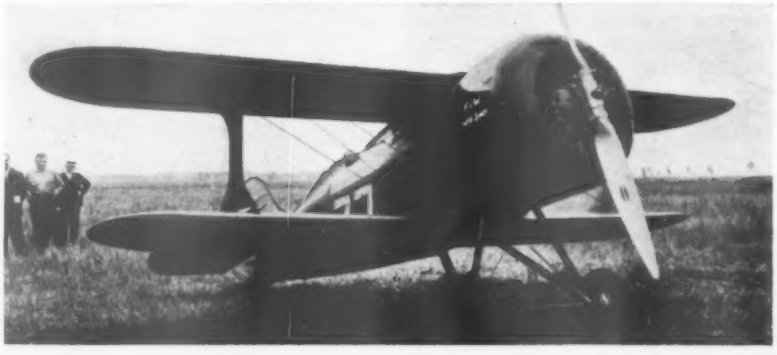
1929—Won first annual Gardner trophy race, Memorial Day, St. Louis to Indianapolis and return at average of 157 miles an hour.

1929—Won 800 cubic inch closed course race at Cleveland races.

1930—Won the Thompson trophy race at Chicago, setting record for speed.

1930—Set new speed record from Minneapolis to Chicago, one hour, 40 minutes.

Holman set a new closed course record of 201.91 m.p.h. in winning the 1930 Thompson Trophy Race with the Laird Speedwing "Solution" shown here.



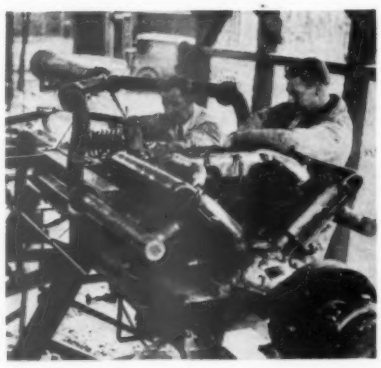
Flames Will Operate Automatic Extinguisher

FIRE hazards in aircraft will be greatly reduced by the "flame switch," an apparatus tested at Roosevelt Field several weeks ago, according to Robert Irving, its inventor. The device, based on the fact that flame will conduct electricity, can be hooked up with any built-in extinguishing system. A wind-driven generator, however, would have to be installed. The present motor-driven generators could not generate the necessary current.

The apparatus, which weighs 12 pounds and looks a great deal like a small radio receiving set, consists of an alternating-current transformer, two electrodes and a magnetic coil. The transformer receives 110 volts and steps it up to 5,000 volts. The two electrodes which contact the flame are connected with a magnetic coil, which, in turn, closes a circuit to the extinguishing apparatus.

The ordinary extinguishing system is hand-driven and, should fire occur, the occupant of the plane by pushing a lever releases a chemical stored in a tank to many small connections under the cowling, carburetor and motor, quickly extinguishing the blaze. In an airplane equipped with Irving's apparatus, sets of electrodes could be scattered in various locations and the flame resulting from a fire would close a circuit and with a motor-driven system work automatically.

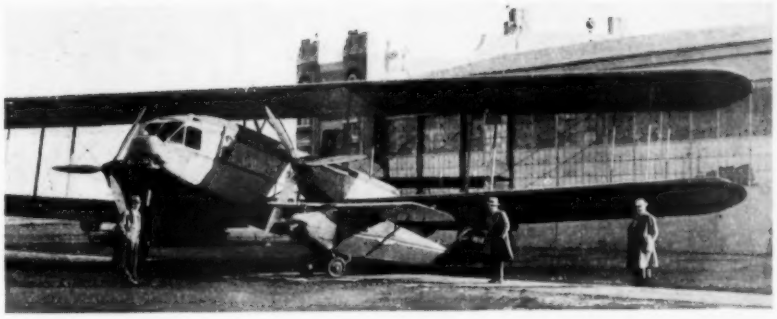
Test Mufflers to Reduce Noise



EXPERIMENTS now being made by the Aeronautics Research Division of the Department of Commerce and the Bureau of Standards at Washington may effect a considerable reduction in the amount of noise made by aircraft engines by means of special mufflers, such as are used on motor cars.

A 180 horsepower V type 8 cylinder engine has been installed on a test stand and various types of mufflers will be connected with it and the intensity of noise and loss of power, if any, carefully recorded.

This view shows Arthur Herbert and Edwin H. White, of the Bureau, with the engine which is equipped with one type of muffler.



The Packard-Diesel Engine

THE Packard-Diesel aircraft engine is revolutionary in many respects. It burns a petroleum distillate resembling ordinary furnace oil, and if desired, ordinary airplane lubricating oil may be mixed with the fuel to obtain greater flying range. Diesel fuel will not catch fire accidently, but will actually extinguish a flame when poured over it.

The Diesel has no carburetor, magneto or spark plugs. Ignition is obtained by spraying fuel into air compressed in the cylinders until it reaches 1,000 deg. F. Continuous ignition is assured throughout the life of the engine, since this is furnished by cylinder compression.

The engine does not depend on a finely balanced ratio of air and fuel, but automatically adjusts itself to changes in altitude or temperature. For this reason it will not stop through too lean or too rich a mixture. This feature also permits using maximum power for take-off or climb by injecting excess fuel at a full throttle without detriment to the engine or its operation.

The Packard-Diesel aircraft engine has nine cylinders, weighs 520 pounds, and is officially rated at 225 horsepower by the Department of Commerce.

Curtiss Condor Catches Fire With Eighteen Aboard

THE newspapers of May 16th carried the report of a fire discovered aboard a Curtiss Condor transport plane while it was flying between Richmond and New York. After fighting the fire in the cabin for over five miles, the plane made a safe forced landing at Fort Hoyle, Md. The eighteen passengers scrambled from the burning transport and the fire was extinguished by airport attendants.

Much speculation was aroused as to how a fire could originate in the cabin of the plane, but this point is cleared up by the president of the transport line which owned the plane. In an official statement, he says that the pilot's reports "disclose the cause of the fire to have been defective insulation of the heater pipe at the point where it entered the fuselage. There is no possibility that the fire was caused by a match or cigarette."

The Extremes in Cabin Planes Meet

NOT long ago, when O. G. Corben, designer and manufacturer of the Corben Baby Ace, was down in Wichita, he thought it would be interesting to compare his Baby Ace, one of the smallest cabin planes on the market, with the Condor, one of the largest American transports.

So he tucked his Baby Ace under the wing of the Condor and here we see them—the Mutt and Jeff of airplanes.

The Corben Baby Ace is of particular interest to lightplane enthusiasts and home builders, inasmuch as it is available in either open or closed models, and the open model may be made into a cabin job with only minor changes.

Standard Glider Becomes Novel Training Device

WARD SWIFT of Scituate, Mass., recently completed a new glider training device which he hopes will revolutionize instruction in that mode of flying. This new contraption is a regular sized primary glider suspended on a universal joint mounted on a steel plunger, allowing the pilot to manipulate the controls as if in actual free flight.

The machine is complete in every detail and the only thing it can't do is crash. Mr. Swift thinks his machine will be a great help to the student since he does not have to take to actual flight in securing experience in handling a glider. Here we see Mrs. Swift, wife of the inventor, handling the machine on one of its first trials.

What was left of a tank, resting against what was left of a tree near what was left of a railroad. Heinsen took this view from an altitude of about 300 feet.

I Photograph the Enemy from

A rare glimpse of the war from the German flyers' point of view. The author illustrates his reminiscences with some of the most striking photographs ever submitted to Popular Aviation.

THE combat pilot and the combat squadrons—they have enjoyed the full glare of the spotlight in both fact and fiction articles of the war. It seems to me that the aerial observers have been slighted. For, while it is true that the combat and bombing planes presented the more romantic and adventuresome side of aviation's great part in the World War, the observation planes were of far greater value to both the high command and the ground armies.

The reason for their greater value is obvious. Let a combat plane fail to return from behind the enemy lines—and what did it matter? (Unless the pilot was a Richthofen, or an Immelman, or a Boelcke.) But let a photographer fail to come back with the precious negatives for which he was sent—and it often meant that a contemplated advance would be held up for hours.

Entirely too often, the aerial observer never came back! Flying in a heavier, slower plane, he was "cold meat" for almost any enemy combat plane.

There were two distinct types of aerial observing. One was the directing of gunfire. The other was the photographing of enemy territory for mapping purposes. I was one of the aerial photographers. Germany did not have enough of us; therefore, we were always being rushed from one front to another, inasmuch as the constant changes in the ground work being done by the Allied forces and the shifting of the position of their batteries had to be mapped almost from day to day.

Naturally we cameramen were among the first to know when a great drive was being planned, although we were seldom certain of its exact nature. For instance, when the German drive of March, 1918 (from south of St. Quentin to north of Arras) occurred, we had been out photographing that section for a month in advance!

As proof of the tremendous importance of our work, I call your attention to a happening in the latter part of October, 1917. The great English offensive at Kemmel (a strategic point from which the surrounding flat country could be viewed for miles) had been a failure. But the Germans expected another British drive north of there. Almost every squadron in our air force was rushed to that area.

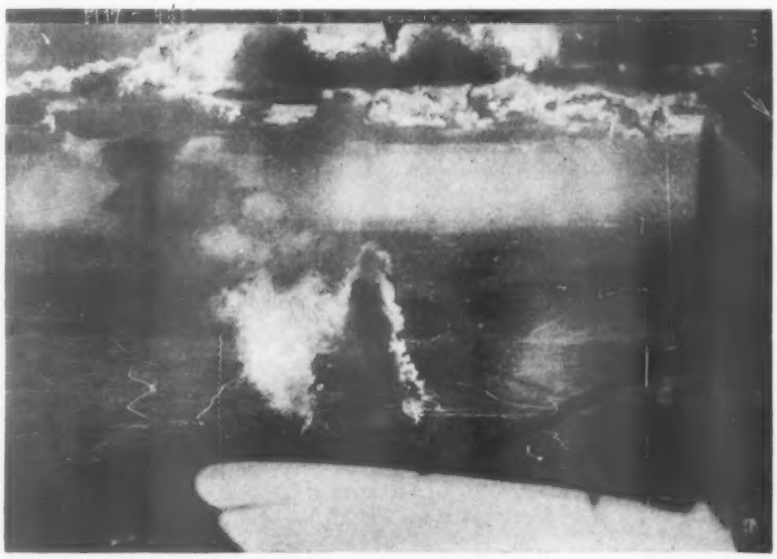
I shall never forget the feverish speed with which our preparations were laid and the difficulties under which we worked. Hangars were erected in heavy rains and wind storms. The ground was a mire. Mud? We ate it, slept in it, and wore it. Everybody labored day and night.

And when at last, in early November, we were ready, the English fooled us. Taking advantage of the soup-like fog that hovered over the land for days, they brought up their tanks en masse and struck a terrific and unexpected blow at Cambrai. That the initial part of their drive was a big success is well known to all; yet, they could never have performed this piece of strategy had not the bad visibility made work for the German aerial observers an absolute impossibility.

THE duties of the observer were always thrilling. Sometimes he was ordered to take close-up views of the enemy's front line trenches. Sometimes he photographed them from a great height. But, while subjected to considerable gunfire during these missions, neither task held as much danger as that of going twenty-five or thirty miles behind the opposing line, taking the desired pictures and *trying to get back.*

Ordinarily, a single plane flying at a high altitude behind your line could be considered an enemy aerial observer at work. It would be useless, of course, for a ground squadron in that vicinity to go up after him—he'd have plenty of time to make his getaway—so, instead, you merely phoned one of your squadrons located closer to the front and asked them to hand him a warm reception on his return. The result,

The village of Meaulte is seen burning after it had been bombed by German planes. Note the tail of the German ship from which the photograph was taken and also the official identification marks on the upper border.



the Air

by

WALTER A. HEINSEN
Former Aerial Observer, German Air Forces

Baron von Richthofen's Fokker triplane in which he was shot down. The photo of Richthofen's grave shown below was dropped behind the German lines by a British airman as a mark of respect to a fallen foe.

unless the photographer and his pilot were clever (or lucky), was anything but pleasant for the occupants of the observing plane.

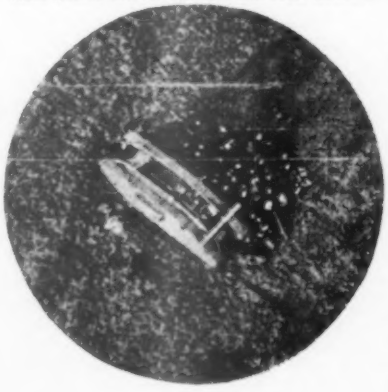
But we managed to get a certain amount of fun out of our work. I re- picture-taking trip far behind the British front. It was a beautiful, warm spring day. Suddenly my pilot (his name has slipped my memory—we ob- call one time I was returning from a servers didn't always have the same man in the front cockpit) caught my eye, grinned fiendishly and motioned downward.

Directly beneath us was an English cavalry depot. What a peaceful scene! Some of the men were basking lazily in the sun. Others were currying horses. None of them seemed to be aware of the tiny speck in the sky above them.

I knew what was in my pilot's mind and I nodded assent. We dove down, swept over them at a height of less than a hundred and fifty feet, and I let loose with my machine gun. I can still visualize the astonished looks on the faces of those fellows as they stared up at us. Turning quickly, we roared back over them again, but this time I did my shooting with a camera instead of gun.

The scene I snapped was one of the most laughable ones I've ever witnessed. Horses were galloping madly in several directions while Tommies were headed toward all points of the compass.

A remarkable photograph of German infantry actually attacking a British tank. The tiny white points are reflections from steel helmets.



Evidently I hadn't wounded anyone, for everybody in sight was displaying more running ability than an injured person is capable of exhibiting. The pilot and I chuckled all the way back to our airdrome. But the day was not yet over. . . . .

At one extremity of our airdrome was an old farmhouse. That evening, as dusk was falling, some dozen of us were seated in front of it eating our supper. Far above us, the hum of an airplane motor was audible.

Almost any one of us was able to distinguish the difference between the sounds of the German motors and those used by the Allies, but for some unexplainable reason none of us paid the slightest attention to the sound this evening. Perhaps we merely took it for granted that one of our own flyers was returning later than usual, or that a pilot from some distant airdrome had decided to land here rather than continue homeward in the ever-deepening gloom. We were not prepared for what was going to happen.

The British pilot (I have often wondered whether he did it in retaliation for the cavalry depot farce) swooped down, thundered over us and sent a stream of bullets into our midst. He wounded six men, two of them badly. There was a mad stampede toward the farmhouse. Back came our visitor, but at a much greater height, and he dropped two bombs, each of which struck a hangar. When he had gone his way, we discovered that four Fokker combat planes had been shattered beyond all hope of repair.

I'm willing to bet a pedigreed bulldog against a warm frankfurter that he laughed gleefully as he sped away. Well, why shouldn't he? He had to have *his* fun, too.

ONE of the observers in our squadron was scarcely larger than a midget and used to furnish much amusement for the rest of us with his unique method of obtaining pictures. He used a camera that must have weighed about fifty pounds, and to which he had attached a heavy leather harness that went around his neck and beneath his arms.

This harness arrangement enabled him to lean far out of his cockpit, resting his entire weight upon his stomach, and snap scenes directly beneath him without danger of losing his camera. Each time he left the airdrome, we actually expected him to lose his balance while performing this ludicrous but very effective feat and come back dangling over the side of the ship on his safety belt. But our expectations were never realized.

We had observers in our squadron who were dare-devilish to a degree that bordered on idiocy. Two of them, named Wilhelm and Hermann, had taken quite a dislike to each other, and the rivalry between them to see which could bring back the most impressive negatives had reached the stage where each was willing to subject his neck to far greater risks than his work really called for, in order to "show up" the other. Unfortunately, their pilots had gotten into the spirit of the thing and were more than willing to participate in this foolhardiness.

One chilly day in March, 1918, Wilhelm and his pilot were killed while attempting to take views of the British second lines from a ridiculously low altitude. But did this end the rivalry? It did not. Smarting under the realization that Wilhelm was still leading by a slight margin, Hermann determined to outdo his dead rival.

He died on the following day while performing the same bit of recklessness that had brought death to his fellow cameraman. If they are together now in the Great Beyond, I'm sure they are still arguing about their respective daring and ability as photographers.

We had one observer who, in my estimation, met a most undeserving death. He had a pilot whose real name I do not care to divulge, but whom I shall call Karl. Karl, who was a very

(*Continued on page* 54)

The Northrop Beta—an All-Metal Advanced Trainer

Every detail of the Beta is streamlined to the last degree. The result is a top speed of 175 m.p.h.

The Beta carries as standard equipment an electric starter and an unusually complete set of instruments.

THE Northrop Aircraft Corporation has recently introduced a high speed utility plane and advanced trainer known as the Beta.

It is a two place job with metal monocoque fuselage and metal wings and tail surfaces. The landing gear consists of full cantilever air shock absorbers and fully streamlined pants-gear is used.

The Beta is normally powered with a 160 h. p. Menasco Buccaneer engine. This is a six-cylinder, air-cooled, inline, inverted model and affords excellent visibility for the pilot. The plane sells for $8,500, flyaway factory.

High speed	175 m.p.h.
Stalling speed	48 m.p.h.
Cruising speed	145 m.p.h.
Climb	1150 f.p.m.
Absolute ceiling	25,200 ft.
weight empty	1,135 lbs.
Useful load	635 lbs.
Gross weight	1,770 lbs.
Cruising range	560 mi.
Span	32 ft.
Length	21 ft. 8 in.
Height	6 ft. 1 inch

Lightplane Pontoons are Interchangeable with Wheels

NOW the sport flier can pick up his pontoons, walk to the water and transform his landplane into a seaplane with great ease. To care for the new crop of "flivver" planes which have made their appearance in numbers this year, the Aircraft Products Corporation have built pontoons that weigh but 37 pounds each.

The floats are so designed that the gear by which they are attached is just as simple as a landplane landing gear. The structure of the float does away with the cross spreader bar necessary on larger floats. This decreases the resistance of splashing water and

waves, which is an important item in the performance of these low-powered planes. Head resistance in the air is also lowered by the elimination of several struts.

Air Commerce Regulations Are Revised

A REVISED edition of the Air Commerce Regulations has recently been issued by the Department of Commerce.

Among changes which appear in the revised edition is one providing a special classification for light airplanes among the weight classes of aircraft for which a licensed transport pilot may be rated. Heretofore, the first weight class has included all planes of not more than 3,500 pounds gross weight. In the amended regulations, however, the first weight class includes planes weighing not more than 1,000 pounds.

Another revision explicitly includes exhibition parachute jumping in acrobatic flying and provides for its regulation by the Department. In the requirements dealing with repair and reconstruction of licensed aircraft, a paragraph has been added to provide a procedure for approval of repairs to licensed gliders. If a glider is damaged more than 50 per cent, or if the contemplated reconstruction is that extensive, it is required that the work be done by a licensed airplane mechanic and approved by an inspector of the Department of Commerce.

Copies of the "Air Commerce Regulations," which are published as Aeronautics Bulletin No. 7, may be obtained without charge upon request to the Aeronautics Branch, Department of Commerce, Washington, D. C.

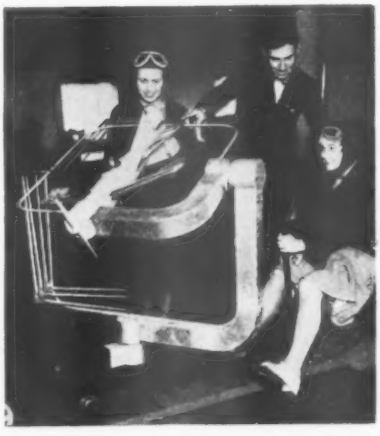
Official Explains Curtiss Junior Fire

"I SHOULD like to know," writes Howard Reid of Roggen, Colorado, "whether you received an answer to your telegram of March 13 to the Curtiss-Wright Flying Service concerning the reported burning of the Curtiss Junior."

More than two months later Casey Jones, vice-president, explained the truth of the reported burning of the Curtiss Junior in a letter addressed to the editor of POPULAR AVIATION. According to the Curtiss official, "the mechanics were doing some welding on the motor mount, and in spite of the fact that they used every precaution . . . a sudden spark flying up from the welding outfit ignited the wings, and they burned almost instantly."

Thus ends the mystery of the Curtiss Junior fire.

Training Device Duplicates Large Planes' Stunts



DEVELOPED by a Seattle flying instructor this ingenious ground student's apparatus is now in use in a Seattle Aviation school. The tiny model of the plane is pivoted in the framework so that it can perform all the gyrations of a plane in action.

Air jets, supplied by a motor and fan, are directed against the ship by operating the controls exactly as they are operated when flying. Loops, dives, banks, rolls and all other tricks of flying men can be performed as the student applies pressure to the rudder and moves the stick to various positions.

In this photo Dorothy Wicks, University of Washington co-ed, takes the controls while C. K. Kimmick explains the operation of the device to her and Bebe Starr.

An Idiosyncrasy

MISS RUTH NICHOLS, the woman flier who set a new altitude record for her sex a few weeks ago, just can't stand tall buildings, fast elevators or roller coasters, she admits.

SPROUTING WINGS

"I'm not as smart as I thought I was," says the author of these amusing revelations. She recounts the trials and tribulations of a young lady who would be a pilot.

by

PEARL BUNKLEY GRISSOM

I HAVE had my first thirty minutes in the air. Gee! I'm as excited as a kid. I kept having to bring my stomach back to its natural habitat, and I don't think I learned much. But at least I got started, and I'm going to keep at it. I sure have a lot to learn, though. I never was in but one plane before, and that was right after the war, in one of the old army Jennys.

When Derry, my instructor, strapped me in, I was so low I couldn't see the nose. Business of sending for an extra cushion. I was still too low. With another cushion under me, and one to my back, I could see out a little, and also reach the pedals.

Then, Derry put on me a funny kind of helmet that has two holes in it, one at each ear. Into these holes he stuck some tubes. This hose extends into the front cockpit and has a transmitter on that end of it, into which Derry seems able to talk at any time at all.

This telephone apparatus was designed by a man—a married man, I feel positive—and, I would venture the guess, a man long married to a garrulous wife. It offers one incomparable advantage: you can say anything you want to the lady in the back seat and she can't answer one word.

Derry had me look at the instrument board. "This," he said, "is the something-or-other, and it shows how high you are. And this is something-else-again and is controlled by——" My mind bucked at the thought of learning about so many little jiggers the first morning. I wanted to fly, not talk.

Derry climbed in, and before I knew it we were off. It was a little disappointing. I had expected to feel like an express elevator, or at least like a high swing, but the motion was so gradual and easy that I was surprised to look down and think, "Goodness, there goes the ground—now I'm flying—isn't it easy?—how little and crooked our high-priced highway looks—I wish an old buzzard would come along now—I'm flying——" Then I was rudely awakened by Derry saying, "Now, set the sptkloxyzchtmeter at fifteen." Back to earth! (Figuratively speaking.)

If you have ever looked at the instrument board of an airplane, you know that it is fairly freckled with little jiggers with numbers and things on them. And they are all discouragingly alike. It looks like the dashboard of the car I have always wanted to own. Now, which little round, black jigger with white figures was the particular one that Derry seemed to think needed attention, I did not know. But I could see that one of them stood around forty-five, and one around sixty, while another was about eighteen. I placed my money on the eighteen. At least, if it proved wrong, it looked like less damage would be done.

So I nonchalantly began to toy with levers. Derry said, "Don't bother that. Put it back. That is mixture, rich and lean." I pushed another likely looking one. "That's the spark. It's the long one at the bottom." Why couldn't he have said so in the first place! I finally got it set at fifteen, and I am going to remember that that particular lever works that special jigger.

"Got it?" asked Derry. Silent but vigorous nodding on my part. I don't like this one-way telephone idea.

"Now, take the stick—see?—ease it forward and she goes down—pull it back and she goes up—that's it." And sure enough, it did, only more so, when I tried it.

Derry said, "Remember this: when you're in the air, somebody is driving—either you drive the ship or it drives you. It's a lot safer to do the driving." And again, "The first thing to learn about flying is that your ship will do what you make it. Nine-tenths of the accidents are caused by pilots either not knowing what to make a ship do, or getting excited and forgetting."

There was a lot more of the same. Fancy going up two thousand feet to make a speech. You never know what to expect of a man. He probably goes home and says nothing over the dinner table.

"Now, let me have the stick. You follow through. You've had enough for the first time." And down we came as easy as easy.

My first thirty minutes!

When we got out, Derry said, "Are there any questions you want to ask—anything you didn't understand?"

To which I sagely replied, "Yes—I want to know what makes it fly."

Lesson 2

TODAY I went out for my second lesson and had forty-five minutes.

The passenger seat of our plane is in front and has a small door, which makes it easy enough to get into. But the pilot's cockpit was designed for long-legged, six-feet-one males of the species and offers no small problem for a fairly modest lady who is only five feet two.

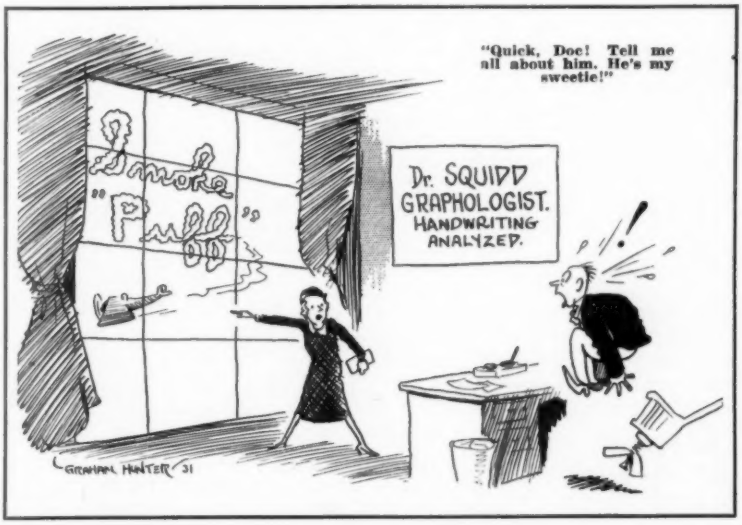
There seemed to be the choice of sending for a long stepladder, getting up on the wing and taking a running jump, and being lifted bodily in by a young giant. The giant and the stepladder having just knocked off for the day, and not feeling any too secure about the jump, I compromised by putting my left foot in Derry's hands and throwing my body over, something in the manner of mounting a horse. Anyway, it worked. I'll have to buy a pair of those trick unionalls that buckle around the bottom.

I love taking off. I like to feel the ground falling away.

"Look," said Derry, "there is Lytle Lake." I wanted to ask, "Where?" All I could see was a ragged-looking pond with roots running out in all directions. About the size of an overgrown bathtub. It took me several seconds to recognize it as Lytle Lake.

"Now, take the stick and go to the Utilities' power house," Derry said. I took the stick, but I didn't have any idea whether to go straight, turn completely around, or what. I looked and looked; not a power house in sight.

"Hold your nose up." I couldn't remember whether to pull or push. Some-



body told me that if you wiggled the stick the instructor would take it. I didn't want that stick a little bit. I don't know of anything I ever wanted less. So I wiggled it. Derry didn't move. I wiggled and wiggled.

"Hold her nose up," said Derry, "and relax. Don't be so tense." I believe he thought I was having a nervous rigor. I made a mental resolution to instruct my instructor about this stick wiggling.

"Now, look under your left wing—I've got the stick—there is the power house." And there it was, in miniature. I never would have recognized it. It is going to be hard to learn to recognize the roofs of things. To me, roofs have always been something to keep the rain out. I am beginning to see that they have personalities all their own.

"Now, turn right and go back toward the field—right—right rudder. There it is, and don't be afraid to use it. Not so much stick. Hold her nose up."

I must have a subconscious desire to get back to earth. I keep her nose down all of the time.

"Now, we are going to do a few banks. You follow through two or three times and then you can have it. Now—right rudder and right stick—a little less stick and straighten up—left stick, and pull her nose up. Now, we'll do one to the left." We did it, and it seemed so easy with Derry doing it, and more fun—like a big bird soaring first one way and then the other.

"Now you take it," said Derry. That proved to be different. The first one wasn't so bad, but then I got messed up and couldn't remember to work my hands and feet at the same time. It didn't feel right when it turned.

"Now, fly straight. Oil around sixty? Heat forty or more? Is it pulled down to fifteen?" asked Derry, all in one breath. That instrument board flowed together right before my eyes. First, it looked like there was only one big black thing with white Chinese figures on it; then, for a second, I'd have sworn there were forty-seven varieties. Finally, one by one, I found them, and they were all as they should be. So we banked and turned all over the southeast side of the county.

I don't know what makes me sit so stiff and unnatural. I get to hurting in all kinds of spots. Derry is beautifully casual.

"Don't see any ducks on Lytle this morning. See how one side of the lake is smooth and the other rough? The wind is from the smooth side. Remember that, if you have a forced landing to make, a lake is a good thing to watch. Always land into the wind. You don't drift so far." Into the wind. I can remember that. But I want to add these small words: if I ever have to make a forced landing, I am going just as far from a lake as I can get.

After some more banks and turns we came down. Derry showed me my log book and wrote in it: "Weather conditions, good. Nature of flight, gentle banks and turns."

"Gentle!" I am inclined to laugh. But sober second thought tells me not to forget that all terms are comparative, and maybe when Derry said "gentle," he had in mind what was coming.

Lesson 3

NO TIME to write today and not much to tell. We took off three times and I believe I could do it if I had to, but I don't want to try. I can't remember to use the rudder. I think Derry was rather disgusted today. When I started to get out, he said, "Can you get out?"

I said, "Yes. Why?"

And he answered, "I thought your feet were asleep."

Lesson 4

AS WE went toward the plane this morning, Derry said, "See, the sock isn't straightened out at all this morning. It takes a fifteen-mile wind to straighten it. There's hardly any wind at all, so we will just take off from where we are."

I don't think I am high enough yet. I have three pillows under me and one behind, but what I really need is a couple of inches onto my legs. The pillows worry me. I don't feel as if I am sitting solid enough. Derry says I will get used to it.

It was a grand day, but from fifteen hundred feet up, we could see a big blue bank in the north. Derry said it was a "norther" coming.

"We will do some straight flying this morning. Set her at fifteen. Got it? Now turn and fly due south."

Every day I learn another of my shortcomings. Learning to fly isn't a very flattering business. This morning I learned that I don't and never did have any definite idea of direction. South, to me, has always been the direction in which uptown is from our home, or one town is from another. I see now that I am going to have to learn that east is a point on the compass, regardless of where I start from.

So, when Derry said, "Turn and fly south," although the sun was hitting my right ear I could not, for the minute, remember where south should be. So I began turning and kept on turning until Derry motioned, "straighten up."

By now we have a complete set of signals. When he taps his head on the right side, it means right rudder, etc. They are fairly satisfactory, and would be more so if I didn't get mixed up and give it left stick when he says right rudder.

"Now," he said, "go over to Buffalo Gap, circle the mountain, and come back through Cedar Gap. Remember that a straight line is the shortest distance between two points. And keep your nose up. There's more wind than there was when we started. (I don't know how in the world he knew this.) You'll need a little left rudder most of the time."

(*Continued on page* 51)

Farmer Teaches Himself to Fly in Homemade Plane

HUGO ZIMMERMAN, a young farmer of Omega, Okla., is shown here with a Model T Ford powered plane, which he built in the barn of his farm and learned to fly with no knowledge of aeronautics but what he has read in magazines.

Zimmerman claims that flying in his home-made plane is nothing more than going out in the field and plowing. The plane flies well and is sturdy. The motor is out of an old 1919 truck which he had on the farm.

He has never had one minute of professional instruction on flying, but learned the feel of the ship first by running it over the wheat fields without wings. He takes his two children to school each day in the plane.

Travellers Enjoy Lunch Aloft

WHEN National Air Transport passenger planes are in the air at mealtime, lunches are served the passengers with the compliments of N. A. T.

The co-pilot, or mate, aboard each passenger plane passes down the aisle of the cabin with a tray from which

each passenger makes his or her selection of luncheon delicacies. Passengers say that it is an enjoyable experience to eat as the big planes cruise across the country at the rate of two miles per minute.

Caterpillar Tales

TWO U. S. army flyers recently engaged in a desperate, silent struggle high in the air to dislodge two bombs which had become caught in the wires of their plane, then escaped in parachutes a few seconds before the plane was blown to bits.

Capt. Robert E. Breene, air corps pilot, and Maj. Charles A. French of the coast artillery, were dropping bombs into Chesapeake bay during maneuvers with the tactical school. Two high explosive bombs caught in the wires underneath the plane.

Quick to sense their peril, the two officers shot the craft upward to a great height, executing a dizzying series of loops, spins and violent dives. The bombs held fast. Again the flyers climbed skyward, subjecting the plane to terrific strain as they endeavored again to shake the missiles loose.

To descend would have meant sudden death, as the bombs would have hit the ground before the wheels. To remain aloft was almost equally hazardous, as the projectiles were swinging back and forth like pendulums, knocking together, threatening any minute to explode.

Captain Breene righted his plane from a new series of deadly serious stunts and flew straight out away from the bay and over land. Major French stepped out of the cockpit, poised, and leaped straight out from the plane and its cargo of death. Captain Breene adjusted his parachute, quickly deserted the controls, and followed. The plane bucked and dived unguided.

Two parachutes opened almost simultaneously, and a moment later the flyers, drifting swiftly toward the ground and safety, heard a terrific roar above them. A barage of airplane parts, fragments of engine, bits of wing, catapulted past but did not strike the airmen.

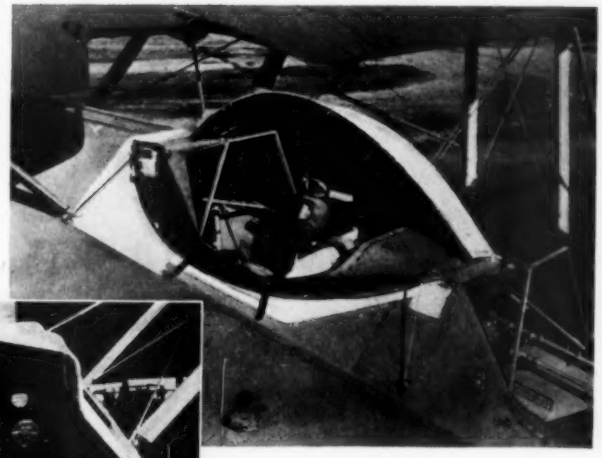
Captain Breene alighted in a clearing in the swamp. Major French, less fortunate, dropped into the tip top of the tallest pine tree in the vicinity. He scrambled sixty feet down its scaly trunk and rejoined Breene.

Flying Clinics Planned

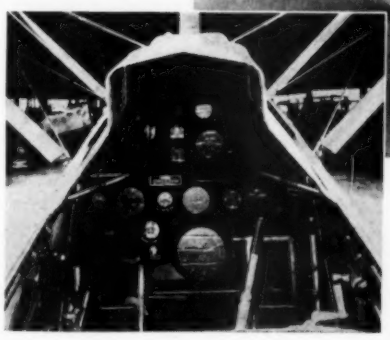
AIRPLANING for nervous and run-down patients is, it is reported, approved by some French medical men as a tonic for the nerves. Physiologists have long known that brief periods to the tops of habitable mountains cause changes in the human body. However, there is little data as to the proper "dosage" of high altitude exposure.

When the exact effect of such treatment upon the human body is known, "flying clinics" may provide the tonic of the upper air, and add the zest and thrill of aviation. Not only airplanes, but dirigibles of large passenger capacity might be fitted to fill any doctor's prescription for "high living."

Army Flyer Designs New Cockpit Cover for Blind Flight Training



Right, the blind flying cockpit is shown with one side of the hood opened. Below, the many instruments that face the pilot and enable him to control his craft while flying blind.



LIEUT. SIGNA A. GILKEY, of Brooks Field, San Antonio, Texas, has designed a new type of streamline cover for the front, or blind, cockpit to be used for blind flying purposes. It is Lieut. Gilkey's belief that this is the first cover of its kind for the purpose for which it is intended.

Of a shape resembling a large clam shell, the cover is fashioned of steel tubing forming a framework over which canvas has been stretched taut, hinged in the center, and folding in the manner of a clam shell. Closing is effected by three clips placed at intervals of about eight inches along the front of the cover, controlled by a rip cord which effects the instant opening of the two halves of the cover.

Not only is this cover an innovation in design, but a new quip to the ventilation problem has been accomplished, since the cover possesses in the front of each half a ventilator, designed so that, while no light or visibility is afforded, an abundance of fresh air is permitted. Also, when the cover is not in use, four straps (two to each half cover) are provided which securely hold the respective sides of the cover firmly in place.

It has been demonstrated, according to Lieut. Gilkey, that the use of this streamline cover does not affect the plane's speed nor, when not in use and in its position at the side of the plane, does it prevent egress from the airplane.

Manufacturer Awards Scholarships for Airplane Design

THE Continental Aircraft Engine Company recently presented two trophies and a scholarship to the University of Detroit as the awards in a contest in aircraft design sponsored by the Aeronautical Department of the University. The contest, which is to be repeated each year, is open to all junior aeronautical engineers. Contestants must design airplanes suitable to be powered by a Continental engine.

The winner of the contest will gain permanent possession of the smaller trophy, as well as the $200 scholarship, which will defray the tuition expenses of his senior year. The larger trophy will remain on display at the University, and will have engraved upon it the name of the winner each year.

In the school year 1930-1931, which is the first year of the contest, forty students are participating. Designs submitted will be judged by a group of men prominent in aeronautical circles.

The judges will base their decision on the highest figure of merit obtained by the following method of grading: (a) completeness and clarity of data submitted with the design—15 points; (b) general arrangement of airplane—55 points; (c) stress analysis—30 points.

In considering the general arrangement of the airplane such items will be considered as: visibility of pilot and passengers—5 points; appearance—5 points; power plant installation—10 points; control system (ease of inspection and repairs)—5 points; cockpit arrangement and comfort for pilot and passengers—5 points; ease of production—10 points; fuel system—5 points.

The thirty points available by proper stress analysis have been divided as follows: completeness—15 points; simplicity of fittings and their analysis—10 points; materials—5 points.

Although it is unlikely that plans submitted by the contestants will be used to construct a plane for commercial use, nevertheless an accurate analysis of every design will be made by prominent engineers to observe novel features of practical value.

How the Navy Selects Its Planes

Here is the aerial proving ground—the Naval Air Station at Anacostia, D. C.

Each new design is subjected to a series of most gruelling tests before it is approved for Navy use. Ensign Ward gives us a revealing picture of what goes on at the testing grounds.

by

ENSIGN CHESTER C. WARD

THE Naval Air Station at Anacostia, D. C., has a definite mission—a mission that makes it of supreme importance to the future of aviation.

For here is the Navy's Flight Test Station; here is where the Navy proves its planes. Records are set at Anacostia. World records; for altitude, speed and load carrying.

But the real work of the station is so important that record-breaking flights are regarded of interest only insofar as they aid in the furtherance of aviation development. Safety and development of all types of Naval aircraft is largely in the hands of Anacostia's test pilots.

The Flight Test Section was organized by the Bureau of Aeronautics in 1927, to centralize the responsibility of flight testing new types of planes. Since then every new plane under consideration as a type desirable for adoption in the Navy—and every change in existing models—has been demonstrated and tested there.

Considering the dramatic demonstrations and exhaustive tests that have been made, the record of safety established at Anacostia is the most convincing testimonial possible to the excellence of design and strength of structure of American-made planes, and to the skill and experience of the test pilots.

The first visit of a new-type plane to Anacostia is for demonstration purposes. Officials from the Bureau of Aeronautics and the air station are on hand to watch the performance.

The plane, as a purely experimental type, and still the property of the manufacturer, is flown during the demonstration by the manufacturer's chief test pilot. Since the demonstration is made with the hope of "selling" the new-type plane to the Navy, each company aims to give the most convincing "show" possible—one that will bring out all the good points of the plane, and back up all their claims for superiority of type.

In the fighting and dive-bombing class are to be found the most spectacular demonstrations. Quite recently a new-type dive bomber was demonstrated, and its thrilling performance warrants description.

The small plane—not much larger than the familiar pursuit type —took off from the landing field with a 1,000-pound bomb in its rack. Swiftly it climbed to ten-thousand feet; then nosed straight down, with its powerful engine at full gun. Almost six-thousand feet were covered in the descent before the pilot pulled the plane sharply up!

Without weakening, the new bomber stood the terrific strain, although again and again the pilot performed the same maneuver. Then he began stunting—all the acrobatics possible to a fighting plane—and he did them perfectly with a 1,000-pound bomb in the rack! Strange and marvelous things are to be seen daily at Anacostia.

IF THE demonstration is satisfactory to the Navy, the order is given the manufacturer for the number of planes needed. The manufacturer, of course, guarantees the specifications of the planes he builds and it is up to the Navy's test pilots to check-up on the guarantee, and determine the plane's adaptability to service conditions.

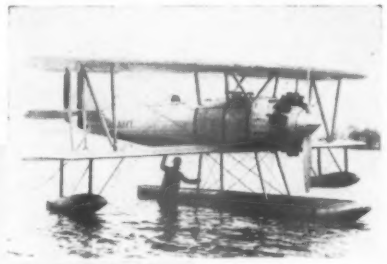
The first plane of the new type comes to Anacostia as a "Service" type, having already passed through the demonstration stage. Now it really has to prove itself, for it is to be put through the routine flight test of the Flight Test Section.

The plane is weighed "dry" to see if it comes up to requirements in that respect. Then it is weighed with full load, to determine the position of the center of gravity. It is examined for structural weaknesses that might be apparent to experienced pilots. If it looks "reasonable" to them, the actual flight testing is begun.

Equipped with a special timing clock, which registers down to split seconds, and a pad of paper which he clips on his knee, the test pilot climbs into the cockpit, looks over the instrument board to make sure the extra test instruments are in place and in working order.

From the instant he takes off, the test pilot is busy recording on his pad; altitudes, air speeds, elapsed time, temperature and engine speeds. In short, he takes the necessary notes that will enable him to reduce his conditions to "standard" conditions; figure the rate of climb for each 1,000-feet, and ascertain the service ceiling.

If the class of plane he is testing



Above, a Vought observation seaplane that held many records at Anacostia. Left, a test pilot receives his clock and knee pad just before taking off in an English Bristol Bulldog.

happens to be a fighter, he will certainly need special equipment to take it to its absolute ceiling. He will need the warmest and most elaborate flying suit, and the most modern oxygen apparatus—both necessities having been previously developed by the Flight Test Section.

World altitude records are often set during these tests, and the Navy's "Wright Apache" fighter at Anacostia holds the World altitude record for both land and seaplanes.

The fighting plane must be taken up to ten or twelve thousand feet and put in a vertical dive for about six-thousand feet to assure the fact that it is strong enough to stand its terminal velocity and pull safely out of a dive.

It must Immelman, fast roll, slow roll, fly on its back; it must loop and split "S" and spin—and, most important, come out not only safely, but in what might be called the orthodox manner.

Doing these things for the first time in new and unproved planes keeps the Anacostia test pilots from becoming bored, for the results are never absolutely certain. They have to spin each plane more ways than the average pilot has ever heard of—they make ordinary tail spins, power spins, inverted spins, outside spins. And it is all done in the interests of safety!

A test pilot, experienced and expecting the "unexpected" is usually able to bring a plane out of abnormal maneuvers which would baffle the service pilots who would probably be taken by surprise. If the plane is found to be undesirably different from normal, it is either corrected or rejected.

EACH plane is tested to see how well it can perform the military mission for which it is intended. If its job is to carry a free machine gun, a free machine gun is installed in the rear cockpit, and a gunner put in charge of it.

Then a test flight is made to determine if there is any feature of the plane that interferes with the gun's efficient operation. Sometimes it is found that the slip stream is so strong at logical fighting speeds that the gunner is unable to operate the gun effectively. Unfortunately, such features as these turn up frequently in flight testing.

Necessarily, the most important characteristics of a fighting plane are rate of climb, strength, maneuverability and effective armament. A dive-bomber must demonstrate its ability to bomb accurately under service conditions. Scouting planes must be especially adapted to radio work; and so on, through the list of plane types and their missions. It is up to the test pilots to plumb these characteristics.

Parallel to the Anacostia station, running up and down the Potomac

(*Continued on page* 61)

Mystery Plane Gets Stuck in the Mud

THIS plane, being towed with a motor boat in the Potomac River, got stuck on the mud flats opposite the Old Dominion Boat Club in Alexandria, Va. It had to be dismantled in order to get it off.

Those working with the plane refused to identify themselves, but bystanders said that the plane was a new flying boat just built by Henry Berliner, a local invenor. The little plane, with a propeller driven by an outboard motor, was flown recently by Berliner. He had built it in secret.

Aircraft Instruments and Their Uses

AIRCRAFT instruments can be divided into three groups: Flying, Navigating and Power Plant.

Flying instruments have to do with the attitude of the ship, such as turn, bank and pitch. The corresponding controls in an airplane are, of course, rudder, ailerons and elevator.

Navigating instruments are for the purpose of determining in flight a predetermined course over the ground. Navigation of aircraft involves direction of flight through the air, motion of the air with respect to the ground, and height above ground.

The power plant instruments indicate the condition of the aircraft engine or engines, the revolutions per minute, temperature, oil pressure, oil temperature and fuel pressure.

When flying weather is good, a pilot can get along without flying instruments. By watching the horizon of the earth, he can tell if the ship is pointing up or down and whether or not it is level. The horizon also tells him if he is turning as well as the speed and direction of turning.

Banking is more a question of "feel" of the ship, and most pilots can tell if they are slipping or skidding in a turn by the way the seat feels and by the difference in air pressure on the face if they happen to be flying an open machine. Flight instruments are, of course, valuable under such conditions, but they are not essential.

If visibility is poor and the horizon becomes indistinguishable, a pilot can still watch the ground under him and fly without attitude indicating instruments although it is more difficult than when the horizon is in view.

However, as soon as the sight of the ground is lost completely, the situation becomes different. Human senses must be supplemented if a condition of equilibrium is to be maintained for any length of time and here flying instruments are essential.

By following the indications of a turn indicator, the path of flight can be continued in a straight line or turns can be made to the right or to the left and at recognized rates of angular speed.

(*Continued on page* 60)

Flying School Will Award Scholarships

THE Hancock Foundation College of Aeronautics, a non profit endowed flying school, is to offer a number of interesting scholarships to high school and college graduates beginning with the August class of the present year.

Two of these awards will go to high school graduates interested in aeronautical engineering. The scholarship will consist of all tuition charges for the two year preparatory course for aeronautical engineering. One will be awarded to a candidate from the eastern or southern states, the other to one from the western or central states.

From among the members of the class convening in August, two additional scholarships will be awarded at the end of the first year of attendance. The cadet ranking first in his class at the completion of this primary training will be allowed to take the transport flying course free of charge providing he possesses the necessary physical requirements. If not, he will be given the final year in his course free and the flying course awarded to the highest cadet possessing the necessary qualifications for flight training.

A further scholarship available to high school graduates is the course in airplane and engine mechanics. This is a one-year course in practical mechanics and associated class studies.

One scholarship will be offered at this time to men having had two or more years in college. This is to be awarded on the basis of a competitive examination, the winner of which will receive the regular one-year transport flying course free.

A One Horsepower Plane

RECENTLY Hans Ritcher appeared at Tempelhof Field with an odd-looking contraption which brought roars of laughter from the other fliers. However, the German flier, whose successful glider flights are known all over Europe, seriously assured them that the one horsepower airplane would fly.

The device carries a man despite the fact that it weighs only fifty pounds and has less wing surface than the smallest glider. It is started by a tiny propeller driven by a single-cylinder motor which is so small it can rest on a man's hand. The amazed onlookers could scarcely hear the exhaust from the motor.

Ritcher tilted the wings of the airplane with one twist of his wrists. He was carried nearly 100 yards before his feet touched the ground. Later tests were made in which Ritcher took off from a steep hillside and stayed up as long as fifteen minutes, covering more than three miles.

Steamer's Funnels Become Ocean Beacon

This Month's Cover Design.

FOR the first time in the history of ocean navigation, the towering funnels of an ocean liner will be floodlighted at night as an extra measure of safety.

Soaring 68 feet above the sports deck of the new Canadian Pacific liner

These lighted stacks are visible for fifty miles.

"Empress of Britain," the three floodlighted stacks, each large enough to hold three Pullman cars, will be visible for 30 miles at sea, and will be seen for more than an hour before the ship herself comes in view.

On dark nights, and especially when there is a low ceiling of overhanging clouds, the flood of light on the funnels will form a diffused moving circle or aura of light in the sky above the ship, and be visible at even greater distances. In all weather, the illumination will make an excellent aviation beacon for dirigibles or other trans-Atlantic flyers, because from 1,000 feet in the air the funnels will be visible for more than 50 miles.

The "Empress of Britain" is 16 stories high from water line to top of her funnels, and a city block long.

New Two-Place Plane is Designed for Private Owners

The States Super Monoplane is a newcomer in the sportplane field.

THE States Super Monoplane is manufactured by the States Aircraft Corporation under an approved type certificate No. 349. It is a two-place tandem monoplane designed and built to suit the needs of private owners.

Powered with a five-cylinder 100 h.p. Kinner radial air-cooled engine, the States is priced at $3,645 flyaway factory. The specifications and performance figures follow:

Top speed	105 M.P.H.
Cruising speed	90 M.P.H.
Landing speed	35 M.P.H.
Ceiling	14,000 feet
Climb	900 feet per minute
Span	32 feet
Length	23 feet
Chord	6 feet
Weight empty	1,083 lbs.
Weight loaded	1,635 lbs.
Oil capacity	2½ gals.
Gas capacity	24 gals.
Cruising range	4½ hrs.

Parachutes and the War

I NEVER see a parachute jump without thinking of two or three incidents of the war involving their use. No American aviator on the front had a parachute, nor did any of the French or English.

Toward the end of the war, however, it became no uncommon sight to see the German pilots and observers jump if their planes were shot out of control.

There is a remarkable case on record of a two-seater machine that made a trip across the lines and returned home without the observer who was made prisoner during the flight. It seems quite impossible that such a thing could happen, but it did and I shall relate the story to you:

One day a German two-seater plane reached our side of the lines in the vicinity of Rheims and began to patrol up and down, finally penetrating to the Allied balloon line.

Suddenly—as things generally happened to airmen—the fliers discovered three French Spads on their tail, plugging away at them earnestly. To escape the Spads the German pilot put his plane in a spin and went down rapidly.

The observer's first thought was that the plane had been shot out of control; to save himself he jumped and drifted to the ground by his parachute. His pilot pulled out of the spin a moment later and got across the lines before the Spads could down him.

The observer was deeply chagrined on seeing his ship fade in the distance, but he had the satisfaction of figuring prominently in one of the oddest experiences of the war.

—J. M. Richardson.

Curtiss-Wright Suffers Huge Loss

WHILE many American aviation companies were spending money recklessly, accumulating huge losses for their investors, similar organizations in France were being operated far more wisely. According to the recent report from the Gnome Le Rhone Company, French airplane engine manufacturers, a profit of $1,183,-720 was recorded for the fiscal 1929-30 year. This company states that it does not receive a government subsidy.

In contrast, the Curtiss-Wright corporation, known as the world's largest aircraft enterprise in point of physical properties, ended 1930 with a "net loss applicable to stockholders" of over $9,000,000.

Valuable Gems Lost in Crash

FOR some time to come treasure hunting will be the favorite pastime of the inhabitants of the village of Moephar in England, the scene of a fatal airplane accident. Two of the victims, Lady Ednam and Mrs. Loeffler, had with them in the plane jewelry said to be worth $32,000.

The wreckage of the plane was scattered over a considerable area and no thought was given to the jewelry until a few gems were picked up in the vicinity and handed over to the village constable. Then a close search was made and some diamonds and jewels were found. It is believed that the rest of the jewels have been trodden into the ground by the crowds that gathered to look at the wreckage.

A Double Fight for Life

The weird experience of a test pilot who literally jumped "from the flying pan into the mire."

by

HAROLD S. CORBIN

ON June 11, 1929, Leon Allen was a pilot for the Wright Aeronautical Corporation. In the course of his duties it devolved upon him to test out a new plane. He flew from the test field in Hasbrouck Heights, New Jersey, to the navy yard field in Philadelphia and had no trouble.

Figuring he was all set and had nothing more to do than to fly back again and check in the plane, he set out from the Philadelphia field on the return trip. Fortunately, in view of coming events, he was alone.

He left the field with a rush. Up into the air, like a race horse eager to be away, the plane darted. Down below him, Allen could see the grouped buildings of the navy yard and the broad gleam of the Delaware river, with its snooty, little ferry boats that convey the commuters into Philadelphia each day from the suburban towns over on the Jersey shore.

The scene intrigued him. June sunlight glinted on the river, turning it to a sparkling, molten stream. Buildings down there appeared like toys. Allen was a god, high up, surveying his domain. Then a thought struck him.

"Good place to test out the instruments once more," he mused. "Might as well do it now as later."

He glanced at the instrument board. Tachometer, altimeter, inclinometer working to a hair. The speed indicator showed him loafing along at a little over eighty miles. He throttled down until the needle pointed to exactly eighty and climbed in a wide circle. Instruments tip-top, still working to a hair. At 2,500 feet, Allen leveled out. He'd give the instruments a sudden jolt to see how they'd pick up. He pulled the throttle full.

With a blasting roar the engine took the gas, leaping forward like a horse stung by the whip. Allen had no time to look at the instruments. In a second there came a crash—a terrific explosion. Before Allen knew what was happening, something hit him on the head!

"I sat down in the seat so hard," he said afterward, "that my spine felt as though it were being telescoped. My vision seemed to fade out. I felt as though I were in a void."

A knock-out blow. Delivered at short range. How long he was out is problematical. Probably not long. Like a fighter down till the count of five, he blinked a few times, put out one hand in an investigating way—and woke up, or partially so.

"My first thought," he said, "was that the stabilizer had let go. But I soon realized that if that were the case, the ship would be doing a nose-dive, and not what it seemed to be doing—a very tight loop. My next thought was that the engine had left me."

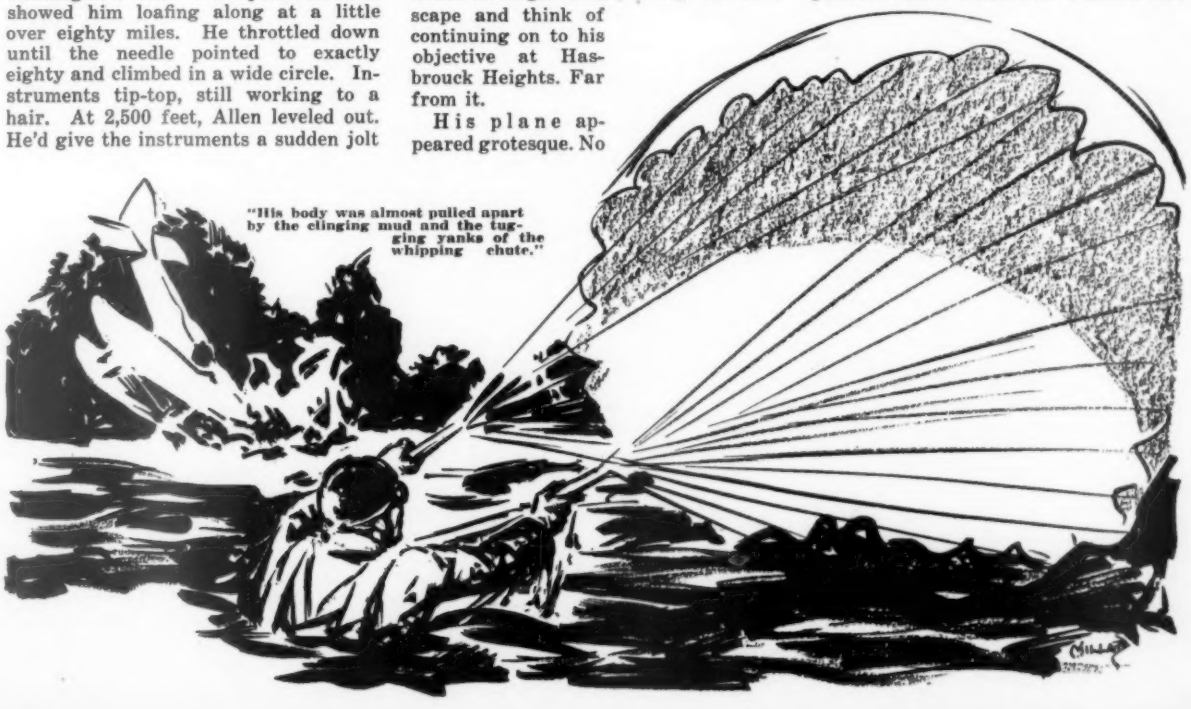
Matters were beginning to clear then inside Allen's buzzing brain. The whirling dizziness slowed up, he said, so he could get his head up out of the cockpit and look over the side. What he saw wasn't exactly a condition in which he might calmly study the landscape and think of continuing on to his objective at Hasbrouck Heights. Far from it.

His plane appeared grotesque. No designer ever fashioned it the way he found it, or had any mechanic ever put it together as it now appeared. Nose up, tail down, it looked like a fish that had been sideswiped by an ocean liner. Wires, ribbons of wing cloth, splinters of wood, tachometer and altimeter attachments streamed backward along the cockpit like metallic entrails of a huge mechanical bird that had been wounded. Connections that normally would have been fitted inside his instrument board rattled and whipped beside him and around him.

And out in front where there should have been a motor, there wasn't anything at all. The motor had disappeared completely, gone overboard, removed itself as thoroughly as a dentist might pull a tooth and hide it behind him.

"I don't know what maneuvers the plane went through," Allen explained later. "I still was too dazed to know much. But as I groped around, trying to find where I was, and coordinate my thoughts, the plane finally came out nose down, right side up, and with the wings nearly horizontal. For a moment the controls seemed effective and I put the stick all the way forward and started reeling in the stabilizer control to counteract the tail-heavy condition."

But the nose kept on coming up. In a second the plane stalled, hung suspended a bare fraction of a second and



"His body was almost pulled apart by the clinging mud and the tugging yanks of the whipping chute."

then fell over into a spin, which quickly developed into a flat spin. Then the action of the controls ceased. They had no further effect whatever.

ALLEN'S senses came back with a rush then. Logical reasoning took the place of blind instinct. The pain of the blow on his head was forgotten and the fog that clouded his brain passed swiftly. Now he was fighting to conquer a crippled plane, striving to bring it to earth without crashing. It was a new plane and, damaged though it was, he did not want to lose it completely.

Once more he tried the controls. They did not respond. Without the motor in front, the ship was unbalanced. It wallowed tail-heavy. Up there in the air, dropping swiftly now, Allen fought a losing battle. The ship was past any effort of his.

There was nothing for it but to jump. Allen had done all he could. He made his decision promptly, and unbuckled the safety belt. His searching fingers found the parachute release ring. He started to climb out.

"Right then," he said, "I got a good scare. I seemed to be stuck in the seat!"

Allen did not realize that on account of the tail-heavy position, he was in much the same attitude of a person reclining in a barber's chair, and was held there by the pull of gravity. But Allen stirred himself. It took him no time to get arms and legs busy. By pushing with his legs he slid up the back of the seat.

Slowly, fighting all the way, he raised his body free of the cockpit. It would seem an easy thing to do, but all the forces of gravity and speed conspired against him.

But at last he was above the seat, clear of the cockpit. Then he leaned backward. Half rolling, half sliding on his back, he kicked with one great effort. He went over the edge.

"I had no sensation of falling," was Allen's comment as he told of his experience later. "I found the parachute ring easily enough in two or three seconds, and pulled it. Almost immediately came the jerk of the 'chute opening. I thought I was safe then."

Above him, directly over his head, opened up perfectly round, hung the 'chute, and Allen felt himself easily suspended there, floating lazily.

"Boy! It certainly was a grand and glorious feeling," he said, "and the 'chute up there, snowy white, like a big umbrella, certainly was a grand and glorious sight."

Below him, somewhere, the plane hit the ground. The crash brought Allen back to a new realization of things still happening. Looking down, he saw he was over the edge of a pond of mud and water that had been pumped out of the Delaware by a dredge. A nice soft place to land, you might say. Mud in your ears, maybe. Cold water down your back, and perhaps sand in your teeth for a while. But you wouldn't

(*Continued on page* 53)

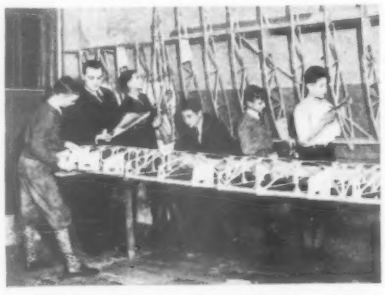
JUNIOR ACTIVITIES
Edited by Paul W. Clough

KENNETH SCHOLTER, 19 of Hudson, Ohio, has set a new world's altitude record for light planes. On April 12th at the Detroit Air Show he flew to an altitude of approximately 19,500 feet without oxygen. The former record 17,037 feet. He decended from 13,000 feet with a dead stick, having run out of gas. The ship weight 382 pounds empty. The flight was made at the Detroit Airport.

* * *

Harold Hill, 18, flew a small monoplane to an unofficial light plane altitude record of 20,000 feet on May 3rd at the Curtiss-Steinberg Airport at East St. Louis.

* * *



Here are some of the members of the Madison Square Boy's Club at work on their glider. Left to right, we see Bruler, Forest F. Brothers, the instructor, Woods, Themm, Williams and Flynn.

In New York City the Madison Square Boy's Club is building a glider with Forrest F. Brothers as instructor. The members are William Bruler 14; Edgar Flynn, 15; Eugene Phillips, 13; William Yurinrak, 13; Joseph Bolz, 15; Harold Woods, 15; John Pulver, 15; John Themm, 16 and Peter Tomasino, 15.

Last October they started building models, but got tired of toys and started the real glider which is almost completed. The address of the club is 310 East 30th St., New York City.

* * *

I recently received a letter from Arthur Romaine, 17, of New York, who has his private pilot's license. He started learning to fly last April and soloed after five hours and forty minutes of instruction in an OX5 Eaglerock. He worked on the field for his time. He soloed on July 2nd and received his license Sept. 16th. To date he has about 75 hours mostly on the same Eaglerock. He has also flown Wacos, Commandaires, Travelairs, Moths and an Eaglerock with a J6-165. His instructor was Edward Keim.

* * *

Fred N. Davis, 17, of Jamaica, L. I., who had his first ride with Bert Moore about two years ago, recently received his private pilot's license. Fred soloed after three hours and thirty minutes instruction last September. He has about 35 hours on OX Eaglerocks, Wacos and Commandaires. His instructor also was Edward Keim.

* * *

Hugh Thomasson, 16, of Hopkinsville, Ky., has been making parachute jumps on Sundays and holidays in order to pay his way through school. He says he has saved nearly enough for a course at the University of Southern California.

Parachute jumping is a new way to pay your way through school, but Hugh sure must want to go to school, to earn it that way.

* * *

We recently received a letter from Joe Morse, of Dragoon, Arizona, who built himself a glider which he has flown a number of times. He says he has learned a lot about airplanes from building and flying the glider.

* * *

We also received a letter from David Strasinger, 16, of Newport, Ky., who has started working at a field near there and plans to learn to fly this summer. He is joining an Aero Club that has two ships in which he expects to learn.

* * *

George Dade and Walter Heikila of Roosevelt Field have been flying their plane around quite a bit. They recently painted it a two-tone red and it looks quite nice. I had it up for a while the other evening.

* * *

Otto Svejda, 16, of New Buffalo, Mich., is learning to fly in an Aeromarine Klemm. His club is to take part in an air meet at South Bend, Ind., on June 6th and 7th. Jimmy Doolittle is to be featured at the meet and Otto invites any of the fellows to drop in for those two days.

Air Travellers Enjoy Radio Programs

AS AN additional convenience for their passengers, Northwest Airways have installed automobile radios in each of their giant air-liners, with great success.

The sets are very easily adapted to airplane use. The loud-speaker is installed on the roof of the cabin and the control panel on the wall of the compartment partition. During tests it was found that in spite of the noise of the motors reception was good and distinctly audible up to a height of nearly two miles. Above this height earphones, which can be plugged in at each seat, are used.

To date no altercations between passengers as to the program to be played have been reported. Expressions of approval from passengers, however, show that the feature is distinctly appreciated.

Squadron Insignia Re-located

EVER since the practice was adopted during the World War of placing a distinctive insignia on the airplanes of the various American aero squadrons, it has been the custom to paint this insignia on each side of the fuselage near the cockpit. This particular location for the insignia, while the best that could be devised under the circumstances, presented the serious drawback of being visible in its entirety only when the eyes were focussed on a direct line with the fuselage, the wings and tail surfaces of the plane tending to obstruct this mark of identification when viewed from an angle.

Army pilots long appreciated the need for improvement in respect to the

Compare the old marking (above) with the new cowl location shown below.

location of Squadron insignia, but were unable to remedy the situation until air-cooled engines were adopted for some types of planes. The metal ring cowl which encircles the engine on P-12C Pursuit planes gave the enterprising pilots of the 17th Pursuit Squadron at Selfridge Field, Mich. a new idea, and they lost no time in obtaining authority to place the insignia of their organization—"The White Snow Owl"—on each side of this ring cowl. In this new location there are no zippers or doors to mar the continuity of the design.

New Pursuits Heavily Armed

THE latest Boeing Wasp-powered pursuit planes delivered to the army more nearly approximate "flying machine guns" than any previous planes. They carry a .50 and .30 caliber machine gun, which are so regulated that fire is between the blades of the propeller spinning 2,000 times per minute.

The Boeing pursuits have a speed of approximately 190 miles an hour. They can pull out of a vertical power dive of 350 miles an hour, and army pilots have climbed these tiny planes to 10,000 feet and back to the ground in six and one-half minutes.

Air Mail Cover Collecting as a Hobby

by FRANK A. COSTANZO, Member, American Air Mail Society

AIR MAIL Covers are letters and cards mailed via air with a seal or mark of distinction known to collectors as a cachet—a general term applied to a rubber-stamped or printed impression, placed on the envelope or card, containing explanatory descriptions used to commemorate inaugural mail flights, airport dedications, air meets, shows, and other aeronautical events.

The cachets used on various covers may be classified according to their origin or source. The official cachet, usually applied in black in various designs, is used on all mail carried on first flights and is applied by the postmaster with permission granted by the Post Office Department. The unofficial cachet is applied in different colors to dedications and other events by the postmaster without official permission, or by the Chamber of Commerce, American Legion, or some other civil organization.

Air mail cover collecting really began back in 1911 when a few pioneer covers were flown, although it can be said that air mail collecting did not come into its own until 1926. At the present aerophilately numbers over thirty thousand collectors among its devotees. A few of these collect only as a side line to stamp collecting but the majority are dyed-in-the-wool cover collectors.

The collecting of air mail covers is not a single hobby, but several hobbies in a hobby. There are over a dozen varieties of covers. Some collectors want all of them, while others specialize in a certain class, yet both have many covers to keep them interested.

The earlier covers, those of 1911 to 1926, are called Pioneer and Experimental Covers. The Pioneers are those which originated in the U. S. before 1918 as a result of special permission granted to pilots barnstorming to fairs, races and other events. These covers were regarded principally as publicity stunts, although the post office was interested in the possibilities of mail carrying by this method. These covers have no cachet but can be distinguished by a special cancellation. The Experimentals are those carried

Thousands of first flight covers inaugurated the new 24-hour New York to Los Angeles service. Miss Genevieve Staley is shown with part of the huge cargo.

by U. S. army pilots from 1918 to 1926 as an experiment to prove the possibilities of regular established air mail routes. These also bear a special postmark.

Contract Air Mail (C. A. M. and A. M.) and Airport Dedication covers are, at the present, more popular than any other phase of the hobby. These all bear the official post office cachet and in many instances also an un-official cachet usually applied by the Chamber of Commerce. The airport dedications are very popular because each new port plays an important part in the development of aeronautics and because many unique designs and insignias are used for cachets.

Under another heading, we find Air Meet, Show, Exhibition, Race and Derby Covers. These are not as popular as the airport covers, principally because they last so many days as compared with the average dedication and a complete set often runs into a dozen or more covers since a different cachet or color is used each day.

Besides these are Memorial Covers in honor of flyers who gave their lives for the advancement of aviation. The Catapult covers carried from shore-to-ship or ship-to-shore by plane to speed the mails. Zeppelin covers are those carried in the airships and are

(*Continued on page* 63)

This interesting accident cover was burned in a mail plane wreck in the Rocky Mountains. It was salvaged and finally reached its destination enclosed in another envelope. As shown here, it is encased in celluloid and can be seen at the offices of Popular Aviation.

The Story of Mother Tusch's "Hangar"

by MARGARET McOMIE

Doug Campbell, War Ace, adds his name to the roll of honor.

TO A tiny, frame, vine-covered cottage in Berkeley, California, aviators—be they great or small—come. They drop in often and with a deep affection in their hearts, for there to greet them, is "Mother" (Mrs. C. A.) Tusch who has made her home into "The Hangar—the Shrine of the Air."

It is an international shrine. There she has created a museum of aviation that has no peer. There, names of those who have written aviation history on skies in all four corners of the earth shall live in the freize of signatures around the walls of three rooms in the modest dwelling.

Upon the walls are the signatures of literally thousands of war heroes. Aviators declare that here is the most complete anthology of flyers' signatures extant. Only those flyers who served in the world war are permitted to sign this Roll of Honor high on the walls above the other treasures and memorials that fill the rooms to overflowing.

Here are such names as Capt. Eddie Rickenbacker, American Ace of Aces; Doug Campbell, first American war Ace; the Round the World flyers, Capt. Lowell Smith, Les Arnold, Leigh Wade, Henry Ogden, Eric Nelson and Jack Harding; General "Billie" Mitchell; Kingsford Smith and G. P. Ulm of the Southern Cross; Sir Keith Smith who flew from London to Australia in 1919; and Okley Kelly, who flew from coast to coast in twenty-six hours.

Here also you will find the signatures of Ernie Smith and Emory Bronte, the first civilian flyers to cross the Pacific; Art Goebel, winner of the Dole race in 1927; Capt. Eimar Lundborg, rescuer of Nobile; General M. M. Patrick, former chief of the United Air Service; H. A. Dargue, commander of the Southern American good will tour; Tex Frolich, Ray Little and Claire Vance, famous air mail pilots of history; Lt. E. M. Deckert, famous French ace; Major-General Reed Chambers, D.S.C.; Col. E. J. Hall, inventor of the Liberty motor; Lt. R. L. Maughan, dawn-to-dusk flyer; O. L. Locklear, famous stunt pilot and the first man to change planes in the air; Lt. L. L. DeJean, poet laureate of the air; Carl F. Egge, general superintendent Air Mail service, 1921-1927; H. M. Pugh, who signed himself as "the living don't for aviators" and hundreds of others we cannot mention in this sketch.

Two vacancies stand out on the crowded walls and these have been reserved for Colonel Charles A. Lindbergh and Rear Admiral M. M. Moffitt, both of whom have promised Mother Tusch that as soon as they visit the bay region their signatures will also rest among the others on this world famous Roll of Honor.

Upon this list, one name alone was

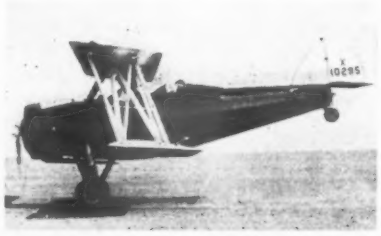
(*Continued on page* 61)

Left, the "Hangar," a tiny frame cottage at Berkeley, California, that is one of aviation's most unusual war memorials. Below, Mother Tusch.

Foolproof Plane Lands Itself

IF landing is your greatest bugbear, consider this picture of Henry White, test pilot, landing a new type of plane without touching the controls. He held his hands aloft as his ship settled to a pretty, two-point landing.

The test was made at the North Beach, L. I., airport after numerous experiments had been conducted in secret. Albert Adams Merrill, who has been active in aeronautics since 1894, is inventor of this "foolproof" plane. He took an ordinary commercial type biplane and made changes in the wings which account for its automatic landing ability. The entire wing structure can be tilted up or down to a maximum angle of fourteen degrees. All the pilot need do is set the wings and cut the engine to idling speed.



To demonstrate the plane's performance, the test pilot lands with his white-gloved hands in the air.

The landing shown in the picture was made at fifty-five miles an hour, but the plane made its two-point contact with scarcely a bump, tail in the air, ran on the wheels a few feet and then the tail settled to the ground.

Isn't This the Cat's?

"TAILSPIN" and "Nosedive" are a couple of frisky kittens that recently figured in the most novel airplane ride a pair of cats ever experienced.

Lieut. David Hissong flies the air mail between Cheyenne and Pueblo. Some time ago just as he was preparing for the takeoff at Cheyenne he was handed a pair of cats with instructions to deliver them with all nine lives intact to the traffic manager of Western Air at Pueblo.

The pilot called for a sack to put them in, but there was no sack. It was then that Lieut Hissong hit upon the idea that will probably revolutionize cat carrying by air mail. It was a bright cloudless day all along the route. No need for the landing lights, so the pilot removed the lenses, put "Tailspin" in one light, and "Nosedive" in the other. He packed a few rags around them to ease the bumps and arrived in Pueblo with both cats in good condition.

The kittens apparently enjoyed the ride. They are mascots at the Pueblo airport, where they run out to meet every plane that taxis in.

How to Build the Heath Parasol

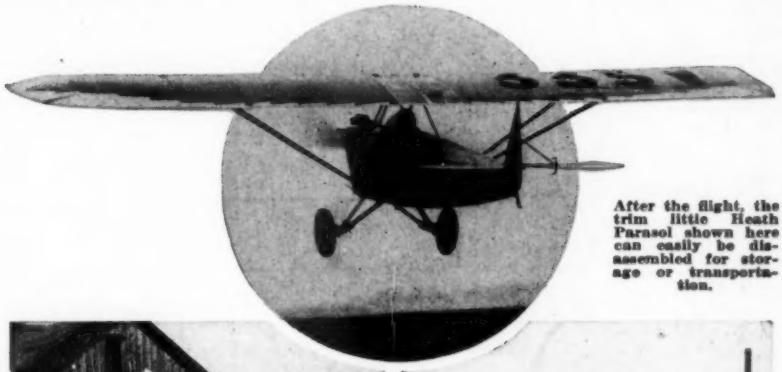
Part VII

Completing the Heath Parasol

(the concluding article of this series)

Specially written for
POPULAR AVIATION
by

E. B. Heath.



After the flight, the trim little Heath Parasol shown here can easily be disassembled for storage or transportation.

THIS installment of the Heath construction article will complete for a great many POPULAR AVIATION readers their own Heath Parasol.

The actual construction work to be done in this concluding installment is rather light. It includes covering the fuselage, installing your motor, making a complete nose and motor streamlined cowling, construction of a windshield, and then the mounting of your propeller and the final assembly of wheels, tires, and lastly the wings.

A number of POPULAR AVIATION readers have indicated that they plan to build the Heath Parasol in the near future, and are saving the back issues of POPULAR AVIATION so as to have the complete set.

As a short resume of all that has gone before (for the benefit of those who might have missed an issue here and there) is as follows:

Part I. Introduction and Construction of the Wing Ribs in December, 1930, issue of POPULAR AVIATION.

Part II. The Wing Structure and Spars in January, 1931, issue of POPULAR AVIATION.

Part III. Continuation of Wing Structure in February, 1931, issue of POPULAR AVIATION.

Part III. Completion of the Wing in March issue of POPULAR AVIATION. (It should be noted that this installment is also called Part III, the same number as the installment in the preceding February issue, since both of these installments have to do with the wing assembly.)

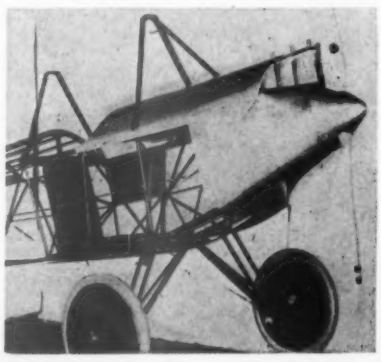
Part IV. Construction of the Bolted Fuselage in the April issue of POPULAR AVIATION.

Part V. The Fairing, Controls and Landing Gear in the May issue of POPULAR AVIATION.

Part VI. The Motor Mount, Struts, Rigging and Covering in the June issue of POPULAR AVIATION.

Part VII. Conclusion, including the Covering of the Fuselage—Cowling and Final Assembly in the July issue of POPULAR AVIATION.

The cowling is easily built up from sheet aluminum. In addition to its effective streamlining, a carefully fitted cowling will greatly improve the appearance of your plane.



POPULAR AVIATION readers have been indeed fortunate in being able to get the only official Heath construction articles ever appearing in any publication. Fortunately the late Mr. E. B. Heath completed all of the construction articles for POPULAR AVIATION before his death.

The offers which he made to the readers who started to build planes from these articles are being carried out by the Heath Aircraft Corp. Any questions in any connection with the construction of a parasol will be gladly answered. At several stages throughout the articles POPULAR AVIATION has forwarded questions of builders who were apparently having difficulty with one phase or another of the construction.

The Heath Aircraft Corp. is also renewing the offer that they will inspect and test hop any parasol brought to their airport, absolutely free of charge, and in addition they will even do this within a 300-mile radius of their airport.

This brings up the rather recent change of address of the Heath Aircraft Corp. They have moved from Chicago, Ill., to Niles, Mich.

As was previously mentioned, POPULAR AVIATION will award a handsome Longines chronometer valued at $100 to the first person who flies his own Heath Parasol built from these articles in POPULAR AVIATION. All that is necessary to be eligible for this valuable prize is to send a photo of your completed ship and a witnessed statement proving actual flight and the fact that the instructions and plans in POPULAR AVIATION were followed.

COMPLETING THE HEATH PARASOL

By E. B. Heath

NO additional tools will be needed to complete this month's work. However, the following materials will be required:

V-405. 13 yards fabric.
V-406. 20 yards 1½" pinked tape.
V-407. 1 piece rawhide 3"x24".
V-646. 2 tires and tubes 20"x2".
Optional Tires and Tubes
18"x3" tires and tubes.
16"x4" tires and tubes.
Material for Cowling
V-720. 2 sheets 36"x72" each 22 ga. (.025) aluminum.
V-721. 24 ½" No. 3 brass wood screws.
V-722. 10 ft. 12 ga. wire (cold rolled).
V-724. 54 aluminum rivets ⅛"x¼".
V-725. 1 propeller spinner.
V-726. 1 spinner plate.
V-727. 1 motor cowl plate.
V-728. 8" ⅜"x22 ga. (.028) steel strip.
V-729. 6" ½"x14 ga. (.083) steel strip.
V-730 8 No. 4/36"x½" brass machine screws and nuts (spinner).
V-731. 10 No. 10/32"x¾" machine screws, washers and nuts.

V-732. 8 No. 6/32"x¾" machine screws and nuts.
V-733. 12" ⅝"x20 ga. (.035) steel strip.
V-734. 28"x14 ga. x ½" steel strip.
V-735. 8 F. H. machine screws and nuts, No. 10/32"x1".

Material for Windshield

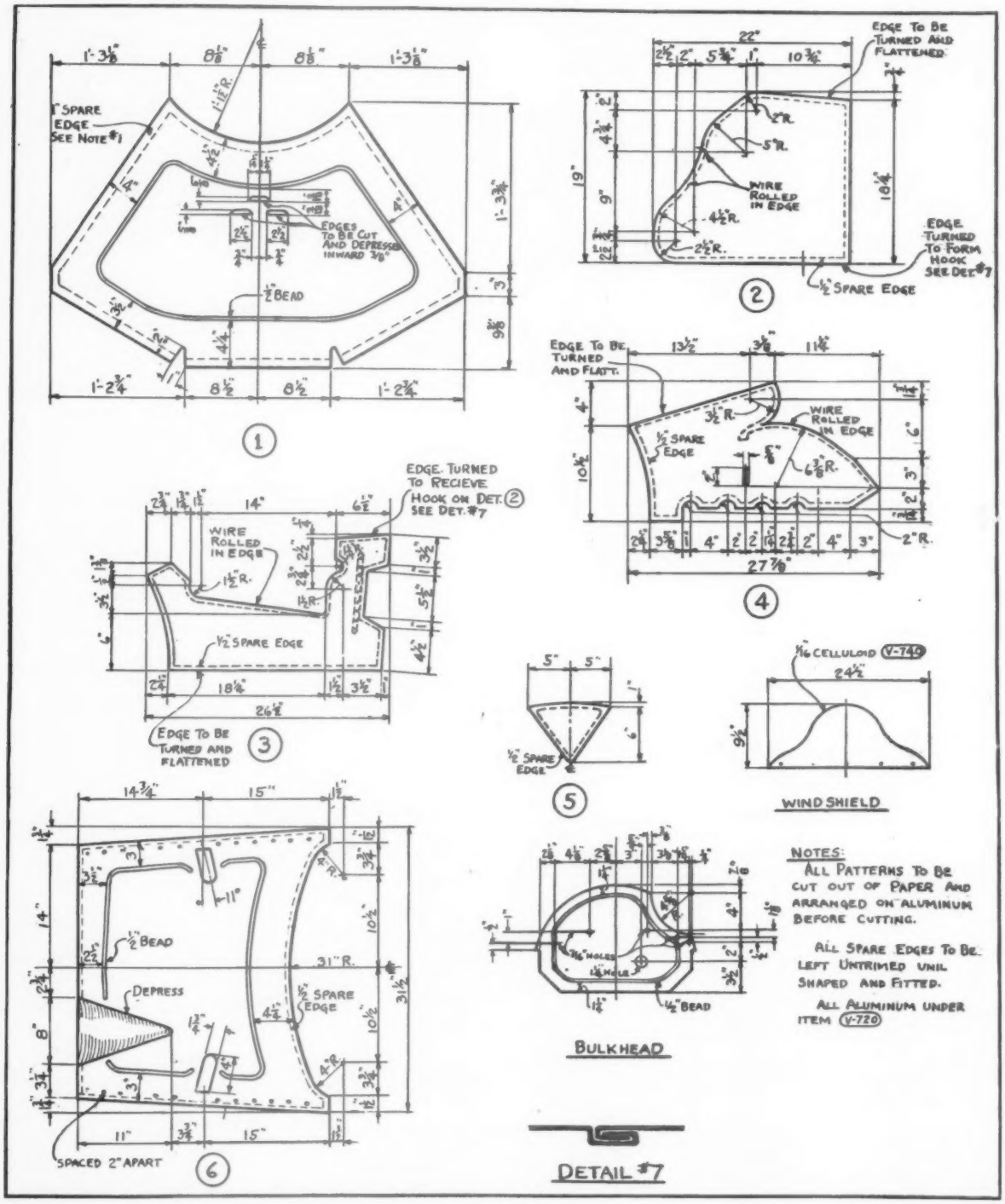
V-740. 10"x2' 1" 1/16" celluloid.
V-741. 5 ⅛"x⅜" aluminum rivets.
V-742. 5 ⅛"-hole washers.
V-743. ⅜"x7"x16 ga. (.051) aluminum.
V-744. 5 No. 6/32"x½" machine screws and nuts.

Procedure

FROM V-734 make eight clamps with projecting ears as shown in detail No. 3 (fuselage print). See April issue of POPULAR AVIATION. These are for the cowling screws and the ears should be doubled over, drilled with an 11/64" drill and tapped with a No. 10-32 tap. The holes for the screws (V-735) which hold the clamp to the fuselage are drilled with a 13/64" drill and the side which will take the head is countersunk.

Offset the ears on the clamps so that they will hold the cowling 3/16" away from the fuselage sides and ¾" from the fuselage bottom. This is done to secure crankcase cooling. Three ears are clamped to each side truss member at the fuselage front and two, spaced 5" apart, are bolted to the first bottom cross strut. These clamps may be

Cowling and windshield patterns.


SPARE EDGE SEE NOTE #1
½" BEAD
EDGES TO BE CUT AND DEPRESSED INWARD ⅜"
1
EDGE TO BE TURNED AND FLATTENED
WIRE ROLLED IN EDGE
½" SPARE EDGE
EDGE TURNED TO FORM HOOK SEE DET. #7
2
EDGE TO BE TURNED AND FLATT.
4
EDGE TURNED TO RECIEVE HOOK ON DET. (2) SEE DET. #7
3
5
⅛" CELLULOID (V-740)
WIND SHIELD
DEPRESS
SPACED 2" APART
6
BULKHEAD
½" BEAD
NOTES:
ALL PATTERNS TO BE CUT OUT OF PAPER AND ARRANGED ON ALUMINUM BEFORE CUTTING.
ALL SPARE EDGES TO BE LEFT UNTRIMED UNIL SHAPED AND FITTED.
ALL ALUMINUM UNDER ITEM (V-720)
DETAIL #7

riveted (V-356)—see April issue of POPULAR AVIATION—in place for additional rigidity.

Fuselage Covering

WRAP 1" tape (V-123)—See June issue of POPULAR AVIATION—spirally with a ¼" lap, around the side and bottom truss members at the front end of the fuselage. Make all turns or wraps from the inside of the fuselage toward the front, to the outside so that the pull of the covering cloth when sewn to the tape will tighten rather than loosen the turns. Stitch fast all tape ends. Remove the landing gear.

From V-405 cut a 16-foot length of cloth. Stretch this piece out and with a straight edge draw a diagonal line from a point 9" from one side at one end to a point 9" from the opposite side at the other end. Cut along this line and you will have made the two side pieces of the fuselage cover. Hold these pieces with clamps or spring clothes pins to the upper longeron with the selvedge or uncut edge ½" above the longeron line.

Cut a 9-foot 4" length of cloth and lay it over the turtle-back so that the center of the cloth strip is along the center line of the turtle-back. Pin to the edges of the side pieces of fabric endeavoring to keep the threads of the cloth as straight as possible. Most of the success of making a smooth fuselage cover depends upon keeping the fibers of the cloth straight. The balance of V-405 belongs on the fuselage bottom. Pin this to the edges of the side pieces.

Now go over the edges again, tightening and repinning them until the cover is smooth and snug and all the pinned edges are along the longerons. Do not cut the cloth at the door opening. Mark lines for seams along the longerons on the cloth. Remove the cover from the fuselage with as little unpinning as possible. Cut away the surplus material to within ½" of the penciled lines. Sew on a machine ⅛" inside of the lines.

When sewn, slip on like a sock with the seams on the inside and stretch into place. Bring the cloth over the top longeron into the cockpit and tack to the nailing strips. Sew to the tape at the fuselage front. Bring the cloth over the top of the first former of the turtle-back and tack along a line ½" from the edge.

Cut a piece of cloth the size of the first former and tack to the surface of the former, keeping the tacks as near to the edge of the former as possible. Cut open the doorway, allowing a margin to be tacked inside. Cut slits into the cloth for all fittings, but do not put the reinforcing pieces or leather guards on until later. Give the entire covering a coat of "dope" and let it dry.

Make guard patches for the control cables from rawhide (V-407) and scrap fabric. Stretch the fabric over a frame and give it a coat of "dope." When dry cut into patches of the size and shape required. Sew the pieces of rawhide to the "doped" cloth and cut openings of the buttonhole type in them to permit the passage of turnbuckles, etc.

The leather on the patches for the cable guard measures generally 1½"x 2½" and the cloth about 2½"x4". Elsewhere the patches vary according to position and use. (See detail No. 1 and stabilizer drawing.) One patch belongs on each wing panel top where the balance cable emerges. Make this of two overlapping pieces of leather opening to the rear to keep the rain from the interior of the wing. Apply the patches with "dope."

Run 1½" tape (V-406) over the seams along the longerons and around the cockpit, fuselage front, the edge of the turtle-back and the doorway. Stick on with "dope." Give the fuselage three coats of "dope."

Cowling

IT IS impossible to make a well fitting front cowling until the engine has been put in place, since the front cowl plate is bolted to the motor thrust bearing case. If you have not secured your motor yet, you can make only the cockpit cowl and the engine bulkhead. These are shown in detail No. 6 in your print.

The cowling has been designed for the limited facilities of the average builder and can be built without the tedious "expanding" or hammering re-

The completed cowling as it appears before assembly.

quired by most cowling layouts.

The engine bulkhead (V-720) is made from a piece of sheet aluminum 19¾"x13" and is quite flat except for the stiffening bead. If there is no tinner in your neighborhood to put this bead in for you, you can make a small hardwood die and put it in yourself. Cut in the end grain of a small block of oak or maple a groove ½" wide and 3/16" deep and on a second small block, a tongue 7/16" wide and 3/16" high.

The grooved die need only be about 3" long and the tongued die about 1" long. If you attach these blocks to hinged arms so that they always register with one another you will have no trouble making your bead. Sandpaper the dies to a smooth finish.

The engine bulkhead is bolted (V-732) to clamp fittings on the front side trusses and on the pyramid. The lower end is made fast to the rear ends of the engine bearers with wood screws.

Cockpit Cowl

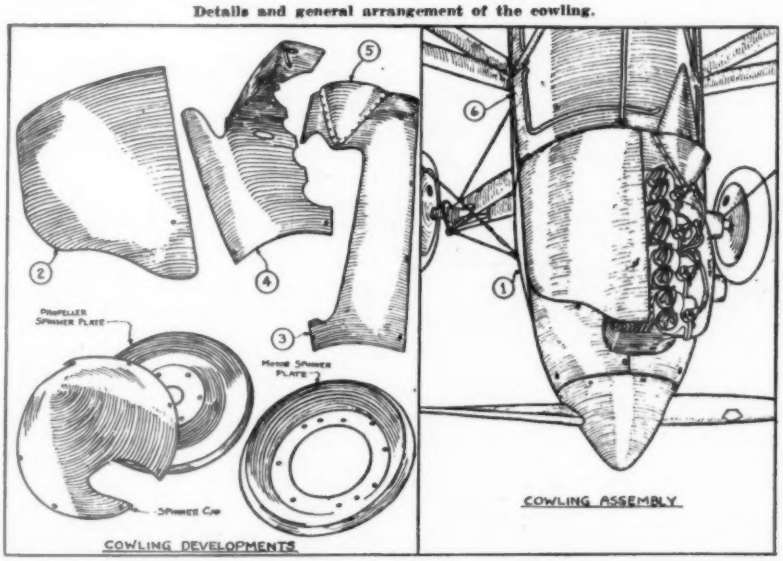
In making the cockpit cowling (detail No. 6) you will notice that there is a V-shaped depression at the left forward edge. This is not "expanded" or hammered in, but is formed by bending the corners or edges of the V over a bench edge and tapping with a wooden mallet to set. The result will be a reverse curve in the edge when the cowling is fastened in place. This can be deepened if necessary to fit the cutout in the engine bulkhead by "ironing" or rubbing with a straight edged piece of wood.

Two openings are cut for the front center wing supports. A length of wire (V-722) is rolled into the rear edge of the cowl. This is done by turning with a small block and a mallet a flange 3/16" high toward the underside of the cowl and laying a wire of the proper length against it. Turn the flange over the wire with a pair of pliers, being careful not to scar the aluminum, and set with a hammer and a blunt chisel. Make the bead as shown in the print.

The finished piece is fastened to the

(*Continued on page* 60)

Details and general arrangement of the cowling.



The Lincoln "All Purpose" Cabin Plane

The A.P. is adaptable for business uses, school training, taxi service or sport flying.

THE Lincoln A. P. is designated as an "all purpose" plane by its manufactures, the Lincoln Aircraft Co., Inc.

It is an attractive three place cabin monoplane and may be powered with either the 100 h. p. or the 125 h. p. Kinner engines. It is priced at $3,995 or $4,395 depending on the power plant selected.

Specifications of the A. P. powered with the 100 h. p. Kinner K-5 are as follows:

Length overall	26 ft., 0 in.
Height overall	8 ft. 3 in.
Span	37 ft. 0 in.
Chord	72 in.
Weight empty	1,320 lbs.
Useful load	828 lbs.
Gross weight loaded	2,148 lbs.
Fuel capacity	36 gals.
Oil capacity	4 gals.
High speed	112 m.p.h.
Cruising speed	97 m.p.h.
Landing speed	48 m.p.h.
Climb	500 ft. per min.
Service ceiling	11,000 ft.
Cruising range	450 mi.

Air Mail Planes Cross Continent in 24 Hours

AIR mail planes now fly from New York to Los Angeles in three minutes less than twenty-four hours. Air mail leaving the Newark airport at 10:45 a.m. lands at the Los Angeles field at 7:42 a.m. the following morning. Allowing for the three hours difference in time the trip consumes less than twenty-four hours.

The previous air mail schedule from the Atlantic to the Pacific coast was 34 hours and 15 minutes, which included a stopover at night at Kansas City, Missouri. The new schedule provides for a 20 minute stop at Kansas City.

This speeding up in the flying time of mail planes across the continent is made possible by the use of planes on the Western leg of the trip from Kansas City to Los Angeles which will maintain an average speed of 140 miles an hour. It is the first time in the history of the air mail service that planes with such a speed have been employed.

Pilot Retrieves Hat

WHEN your hat blows off while you are riding high in an airplane and falls down in somebody's backyard, the thing to do is to swoop down to where it lands, pick it up, and then fly on again. J. V. Neill, an aviator, trying out a midget plane, did it at Chicago a few weeks ago.

The yard in which the hat landed is 20 feet wide and 100 feet long. After he reclaimed his hat by landing in the restricted space, he clamped it on a bit tighter and took off from the yard, and sailed high into the heavens again, after dodging a few telephone wires.

Flying Club Buys New Plane

THE Edgewater Flying Club of Chicago recently took delivery on a new Nicholas-Beazley Trainer. On its flight from the factory to Chicago the plane established a new record for light planes by covering the distance in 3 hours and 22 minutes at an average speed of over 101 m.p.h. 544 pounds of pay load were carried.

The club reports that due to the low operating cost of the new plane they

Chief Pilot F. K. (Slim) Savage and the record-breaking N. B. Trainer.

are now able to offer solo time at $4.50 per hour and dual instruction at $7.50. The club members also appreciate the side-by-side seating arrangement as students are now soloing in much less time than was formerly found necessary.

States Seek to Limit Experimental Aircraft

R. J. BYRNES, of the Heath Aircraft Corporation sends us the following statement in regard to the manner in which a number of states are attempting to pass legislation against home-built or experimental aircraft. The subject is of vital importance and we are glad to bring it to the attention of all those who are interested in the development of aeronautics.

"It has come to our attention that several states are passing laws requiring the licensing of all aircraft flying within their boundaries. Some step should be taken to halt this thoughtless and harmful legislation as the states passing these laws are being far more stringent than the Federal Government.

"No one will deny that any citizen has as much right to build and fly an airplane as did the original Wright Brothers, yet this right is being arbitrarily abridged by the passage of burdensome, ill-advised air laws.

"In our opinion the state has no authority to restrict the liberty or action of any citizen except to protect the life and property of other citizens. Even then, the necessity for such protection must be proved, and in the case of airplanes, it must be established that any certain aircraft is not airworthy before it can be barred from use, as a public menace. The average aircraft inspector is not competent to make this declaration. An engineering education in aerodynamics is required to qualify any person to make such a declaration.

"The states may and are proceeding on the assumption that it is within their rights to declare all aircraft to be unairworthy except on presentation of satisfactory evidence to the contrary. But this evidence, as now demanded, must be in the form of an intricate, lengthy and extremely costly stress analysis. This requirement puts all hope of ever building and flying an airplane far beyond the reach of the average amateur inventor. It works a hardship on the advancement of the science of flying.

"Substituted for this stress analysis should be a series of laboratory tests properly photographed and attested which would establish the strength of the various members of the airplane structure and would still be within the abilities, both financial and physical, of the airplane constructor. Drop tests and loading tests would accomplish this.

"A law requiring the licensing of all aircraft is unconstitutional unless some reasonable means of securing the required license is provided. The requirements for licensing an airplane are not now reasonable, inasmuch as they are beyond the scope of otherwise capable mechanics, and tend to be

(*Continued on page* 60)

Practical Lessons in Flying

by JOHN B. RATHBUN

Further Instructions on Navigation

FLIGHT STUDENT BOB had just completed his first cross-country trip, and as a result of this trip, was rummaging through his textbooks on navigation, trying to recall the lectures given at the ground school. In front of him was a small drawing board with all sorts of weird looking diagrams drawn bewilderingly on the paper.

He was trying to dope out the matter of windage and drift before going to the field so that he could amaze Ed, the pilot-instructor, with his vast knowledge of navigation.

With a last hurried look at these diagrams, Bob put on his hat and trotted out to the airport for his daily dozen. The wind was brisk this morning, coming steadily from the east so that Bob felt that his evening labors over the drawing board had been justified in view of the fact that another cross-country flight had been bulletined for the day.

His first cross-country flight had been in a breeze so light that it was practically negligible in its effect upon the flight, but today the wind factor was of very great importance for even on the surface of the ground it was blowing a good 25 miles per hour.

"I hope that I can unscramble those compass corrections when Ed gives me that quiz," thought Bob, "for I am always getting the variation angle and deviation angle mixed up with one another. The variation angle is the angle between the true north pole and the magnetic north pole as indicated by the compass.

"The deviation angle is another angle altogether for it is the amount by which the compass needle deviates from its correct position because of metal in the plane. And that's that. When a compass is once installed in a ship, the deviation angle at different points of the compass is constant and the amount of the deviation made by the compass can be shown by a table pinned above the compass."

Bob now entered the hangar, after a brisk walk, and found Ed comfortably reclining on an improvised couch made up of a bolt of new fabric and a couple of boxes.

"Greetings, young'un," called Ed with a smile, "the gang are working on the valves of the ship so that we will have some time to review our navigation stuff before we take off. I want to go over the matter of drift with you and also a few little hints on cross-country flights that we have passed up in our other lessons.

"Flying by compass is more complicated than flying a course by landmarks, it is true, but at the same time there are many conditions under which compass flight is absolutely necessary for the landmarks may not always be known or may not be visible. Long over-water flights, night flights or flights in unmapped country are just a few examples of conditions where flying by compass is necessary.

"Question No. 1," asked Ed, "does the compass needle point to true north?"

"No," answered Bob, "the compass points to the magnetic north pole which may be a few degrees on one side or the other of the true north pole. The angle between the true north pole and the magnetic pole varies at different places on the earth's surface and is called the 'variation angle'."

"Very good, now what is the difference between the variation angle and the deviation angle?" asked the pilot.

"The deviation angle is built into the ship," answered Bob. "It is the amount by which the compass needle is deflected off its true reading by the attraction of metal and other local influences within the ship.

"This angle is determined by lining up the body of the ship along a line pointing to the magnetic poles, and then noting the angle of the compass needle made with this line. Afterwards the ship can be pointed east-west or along other known directional lines so that the deviation can be determined for at least eight principal points on the compass."

"Let's go over and just take a peep at the deviation table in this ship," said Ed as he untangled himself from his couch, "it's right over the instrument board. This table is arranged so that the deviation for each of eight compass points is given, for the deviation varies all around the compass.

"The deviation may be nothing at the north or 'N' on the compass, for example, while it may amount to several degrees at the northeast or southwest positions. There are little artificial field magnets for making readjustments but with many instruments it is practically impossible to neutralize the error at all points. Take a look at this deviation card and study it."

"In column (1) are the points of the compass while in column (2) is the angle that the needle makes with the 'N' point on the compass card. This in practice is the angle made by the course with the magnetic North when deviation is not considered. Column (3) is the angle corrected for deviation, either by adding or subtracting the deviation angle (column 4) to or from the magnetic course of column 2.

"Now Bob," Ed continued, "notice that when the deviation is 'east' that the deviation angle is subtracted from the magnetic course angle to obtain the steering course. When the deviation is 'west,' then the angles are added together. Complete compensation for error is not possible at all compass points, but you will note that in this particular case that there is no deviation at the 'S.E.' and 'N.W.' points. Here, of course, it is not necessary to make any corrections for the deviation."

"Now, Bob, please remember this. Every time that any material alteration is made in the ship that it is always safest to check up the deviation angle. Shifting the position of any of the metal parts, of course, always affects the position of the needle and hence the deviation angle is also affected. Large airports always have means of checking up or making compass adjustments very quickly and easily."

BOB considered this advice, and then asked Ed; "Just how do the wind calculations and drift enter into the compass readings, and is it necessary to make a third compass correction to

The deviation chart indicating the correct compensations for the compass in Instructor Ed Keith's plane.

DEVIATION TABLE
FOR
CASCO NO. 3 XP.12256
May 2nd, 1931

(1) *FOR*	(2) *MAGNETIC COURSE*	(3) *STEER BY COMPASS*	(4) *DEVIATION*
N	0 Degrees.....	356 Degrees.....	4 Degrees East.
N.E.	45 "	47 "	2 " West.
E.	90 "	88 "	2 " East.
S.E.	135 "	135 "	None.
S.	180 "	183 "	3 Degrees West.
S.W.	225 "	223 "	2 " East.
W.	270 "	272 "	2 " West.
N.W.	315 "	315 "	None.

the others you have just mentioned in order to make a given point with a side wind?"

"That's just what I was leading up to when you spoke, so that your motion for a new subject is entirely in order," said Ed. "Your cross-country trip was in practically a calm so this subject did not come up before, but today things are a good deal different and this side wind will give us something else to think about. I'll sketch several conditions to refresh your memory and then we will lay out our own course."

Ed moved up to the table and drew a diagram similar to Fig. 1. He plotted the velocity of the ship, the velocity of

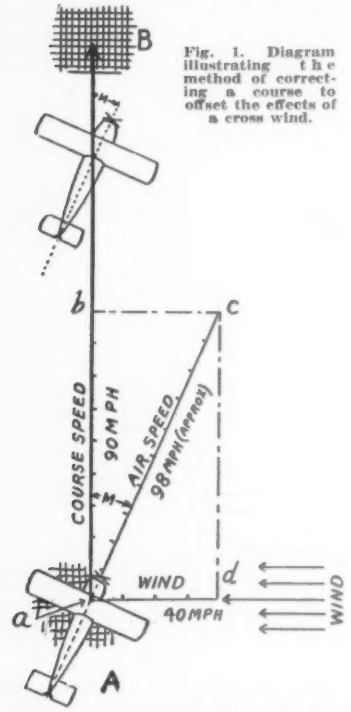


Fig. 1. Diagram illustrating the method of correcting a course to offset the effects of a cross wind.

the wind and the velocity along the course to scale. By "scale" is meant, each inch or fraction of an inch on the diagram represents some definite velocity just as an inch on a map represents so many feet or miles on a map.

All of the velocities in this case, of course, were in miles per hour or "M.P.H." as abbreviated on the diagram. This is a simple, accurate and quick method of estimating speeds that are built up from a combination of different speeds known as the "resolution of velocities."

"Now to begin with," remarked Ed, "the speed of a ship in regard to the earth depends upon the wind direction and speed as I have remarked before. If the ship is bucking straight against the wind, then the speed in respect to the ground is the difference between the ship and wind speeds. If the wind is on her tail, then the speed in respect to the ground is the sum of the wind and ship speed.

"Should the wind be across the course of the ship, however, then the ground speed is a sort of compromise between the wind and ship speeds that that depends upon the angles and speeds. In such a case, the ship no longer points straight along the course she is flying, as is the case in still air, but she crabs slightly to one side pointing a position that is part way between the course and the direction of the wind. The diagram will show this.

"Now let us say, for example, that we are going to fly between the two towns (A) and (B) as indicated in Fig. 1 by the heavy arrow line. The wind is directly across the course or at right angles to it and is blowing 40 M.P.H. We now lay off the wind to scale along the line (a-d), each of the four divisions representing 10 M.P.H. or the total length is equivalent to 40 M.P.H. By drawing (d-c) parallel to the course, and marking off an assumed course speed of 90 M.P.H. at (a-b) to the same scale as before, we can complete a four sided figure (a-b-c-d) called a 'parallelogram.'

"By drawing the diagonal line (a-c) from the corners of the parallelogram, the diagonal will represent the air-speed of the ship when measured to scale, while the angle (M) made by the ship with the course is the angle at which the ship will point while flying along the course. The airplane is drawn at both (A) and (B) to illustrate this point.

"If we scale off the diagonal to the same scale of speeds used for marking down the wind and course speed, we find that the air-speed of the ship will be approximately 98 M.P.H. Therefore, our actual speed over the course will be considerably lower than the ship speed through the air, taking a longer time and much more fuel to complete the trip than in still air.

"One thing that introduces error into a calculation of this sort," said Ed, "is the variation of the wind at different points along the course, both in velocity and direction. If the cross-wind were absolutely uniform all along the route, we could spot her to a hair, but the changes make this impossible.

"The wind varies at the same altitude and at different altitudes so that the best we can do is to strike a fair average wind velocity or direction and let it go at that. Changes in altitude have a great deal to do with the wind velocity, the speed of the wind being much greater at high altitudes than near the ground, and again, the direction of the wind also changes as we go up and down.

"I have seen, just as an example, a wind straight from the south on the field, and this wind has veered around to the west at 2,000 feet and has doubled back on itself from the north at 4,000 feet. This is what makes airplane speed calculations so uncertain, and makes it necessary to check them up frequently during the flight.

"Fig. 2 that I have drawn here, shows how the diagram is laid out when we are given the wind speed and air-speed

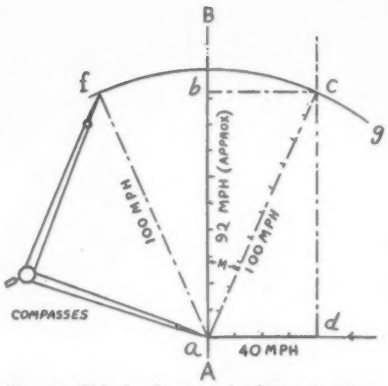


Fig. 2. This is the way to figure a course when the air speed and wind velocity are known.

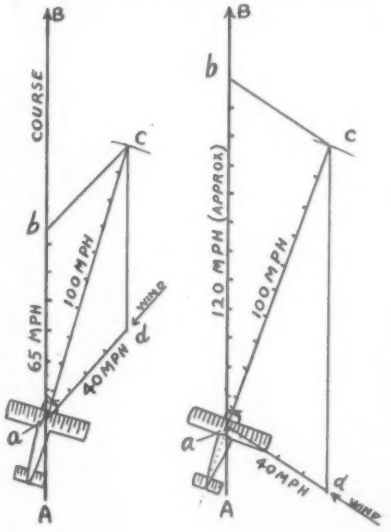
of the ship and wish to find the actual speed along the course. When the wind is at right angles to the course, we scale off the wind speed along the wind line (a-d). Then taking a pair of compasses, as shown in Fig. 2, we spread the points by the air-speed of the ship, which is 100 M.P.H. in this case or the distance (a-f).

"With (a) as a center, we strike an arc (f-g) which intersects the parallel drawn from (d) at the point (c). Next, draw the diagonal (a-c) and project the point (c) to (b) on the course line (A-B). If we measure (a-b) to scale, this distance will give us the speed on the course (A-B). In other words, this is doing the same thing contrariwise in relation to Fig. 1, and the same letters are applied to like parts on both diagrams.

"Now let us look at Fig. 3 where we have the wind coming from another direction, for instead of being at right angles to the course as before, the wind now blows at a sharper angle and still more into the nose of the ship. The diagram, however, is drawn as before with the letters and lines as shown in

(*Continued on page* 57)

Figs. 3 & 4. The ground speed will vary greatly depending on the angle of the cross wind.



New Church Model Ready

Right, this factory built model was sold to Boyd Senter, theatrical star.

THE 1931 Church Mid-Wing, manufactured by the Church Airplane Co. Manufacturing Co., is a refinement of their last year's model that won second place in the National Air Races.

The new Mid-Wing almost appears as an entirely redesigned plane in that the new cowling makes the nose of the ship look entirely different. When the Church in-line air-cooled motor is installed this cowling is standard equipment.

An experimental model of the new Church design is being fitted with the newly developed Church engine. This is a 4-cylinder air-cooled motor having a bore of 3⅛" and developing 38 h.p. without any increase in weight over former engines of less horsepower.

Although flight tests have not yet been completed, it is confidently expected that this new model will set new standards of light plane performance.

New Rocket Motor for Altitude Flights

PAUL HEYLANDT'S latest rocket motor, developing a recoil of 400 pounds, is claimed by the inventor to be capable of hurtling itself in projectile form from Berlin to any point in Europe in twelve minutes or less. Although the motor, which looks like a small cannon, weighs only fifteen pounds and could easily be adapted to projectile shape, the engineers declared they are more interested in perfecting it as a "vest pocket" airplane motor.

The terrific roar of the new motor, which shoots a tail like a comet, is almost unbearable at a distance of a hundred feet and when the power is shut off it gives a parting shriek like the passage of a high explosive shell. Its fuel is liquid oxygen and alcohol, which are mixed and ignited in a cannonlike muzzle. Engineers stated unequivocally that the motor would be capable of propelling itself with sufficient fuel to any point in Europe at bullet speed.

After proposed tests on an auto chassis, the next step, it was announced, would be to fit it into an airplane equipped with a hermetically sealed cabin, for flight through the stratosphere, where the rarity of the atmosphere destroys the efficiency of an ordinary gasoline motor, but the absence of air resistance makes conditions perfect for rocket propulsion.

Boeing Models

BECAUSE of the multiplicity of requests coming from model-builders in all parts of the country for three-view drawings and photographs, the Boeing Airplane Company has established a Model Bureau, which supplies drawings and photographs at cost.

Air Law Violators

THE Aeronautics Branch of the Department of Commerce dealt with 313 violations of the Air Commerce Regulations during the first quarter of 1931.

Fines in the amount of $290 were assessed against and collected from 65 persons, while penalties in the form of 56 reprimands, 84 suspensions, 25 revocations and 7 denials of licenses were meted out for the violations. In 76 cases, evidence was produced which justified dismissal.

There were 60 violations of the acrobatics provisions and 40 of the low flying clause of the regulations. Other specific violations were: Unlicensed pilot flying licensed plane, 23 flying without navigation lights, 10; flying without identification numbers, 6. The miscellaneous offenses numbered 174.

How to Trace Engine Noises

by ROY M. HALL

THE airplane engine or any other mechanism of many parts develops from time to time certain ailments, and the proper diagnosis of these troubles is most important if they are to be corrected.

Trouble is always evidenced by a variation in operation or by the appearance of unusual noises. A great many of the difficulties encountered are easily identified and located even by the inexperienced, so the purpose of this article is to take up and classify the problems encountered that require a little care in the diagnosis.

Only by experience can the mechanic learn the significance of various engine noises, certain tones which cannot possibly be described accurately in writing.

In attempting to pass on the performance of any given engine it is necessary first to acquire a knowledge of the standard desired by the manufacturer for each particular engine, as you must bear in mind that different engines have normal noises that may be absent in other designs. (For instance a geared engine is likely to have noises that direct drive engines do not have). The mechanic who attempts to correct these normal noises will only be wasting time and money.

A good trouble shooter is a man who will approach all jobs with an open mind and a determination to locate the abnormal noises. He must have the proper tool equipment which should among other things consist of a locophone, an oil can with a long spout filled with heavy oil and a wood handle screw driver for shorting out spark plugs.

The locophone is very sensitive and its magnifying powers are such that the user is not conscious of other noises in the immediate vicinity of the engine being inspected.

Generally speaking, abnormal engine noises may be classified under the following headings:

1. Noises that are most pronounced at high engine speed.
2. Noises that are most pronounced when pulling or accelerating.
3. Noises that are most pronounced at idling speed.
4. Noises that are most pronounced when decelerating.
5. Noises that occur intermittently under one or more of the above conditions.

Piston rattle: This will occur only on deceleration or when puling very lightly. The noise will disappear when accelerating and can best be described as an even steady druming of rather a high tone. It is caused by a loose fit of the pistons which can only be overcome by fitting larger pistons to the bore.

Loose piston pins: Are generally loudest when idling but may appear just as noisy at, seven to eight hundred r.p.m. loose pins give a sharp metallic knock and if shorted out will give two knocks. Loose pins will not become louder when decelerating but will usually be less noticeable with a retarded spark.

Piston knock: This is a noise that is always present regardless of the engine speed, and is caused by the piston on its upward stroke striking an offset or ridge worn in the cylinder bore. This can be located by removing all spark plugs from the cylinders and revolving the engine. It can be corrected sometimes by a rebore or regrind of the cylinders.

Piston Slap: This is one of the most common of engine noises and is most pronounced on acceleration from low speeds. The noise is sometimes hard to distinguish from others, but may be identified by the fact that a piston pin

(*Continued on page* 55)

ɔnturers Plan Aerial Expedition

POWERFUL airplane and a deep-seated quest for adventure brought an announcement recently from two Tampa fliers that they would go "rolling down to Rio" soon on a flight that will lead across the gulf, around the Caribbean, and southward wherever the winds and their fancy happen to take them.

The prospective adventurers are Pilots Jack Walton and Louis Milam. Their ship is a sturdy Martin biplane that has been equipped with a new 280-horsepower Hispano-Suiza motor. It is being transformed from a land plane to a seaplane with pontoons in place of wheels.

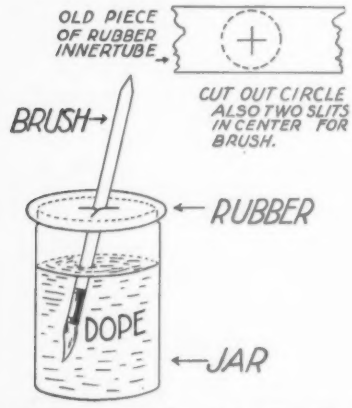
The expedition will be financed by Milam. Walton, owner of the plane, will be chief pilot. He has tested the motor on a trial flight with a climb estimated at close to 1,000 feet a minute. The new power plant gives the plane a top speed of 135 miles an hour and a cruising speed of 115 miles.

They will stop at Havana, Cuba, Belize, Honduras, and will take a full cargo of "gas" up the Amazon river, then they will stop at Rio de Janeiro. From there they will go south along the coast of South America.

Protective Covering Devised for Dope Jar

GARRETT PAUL, of Pottsville, Pa., sent us this clever idea for keeping your dope from thickening while you are using it.

Take an old auto tube and cut a circle out of the rubber about ½ in. larger than the size of the lid of the dope can. Either slit or cut a hole in the middle of this rubber, the hole being the same shape and a little



smaller than the brush handle. Push your brush in and cement around the hole.

When you are doping a model, especially a two-toned one, and are using different colored dopes, your can will be covered and you don't have to put the lid on each time you want to use a different dope.

Bessica Raiche, America's First Aviatrix

by GERALD B. BURTNETT

Bessica just rarin' to go in her clumsy looking crate.

THOSE who sigh for the "good old days" are not aviators of the 1910 era. At least America's first aviatrix wastes no time in regrets.

When re-discovered recently practising as a doctor in Santa Ana, California, Bessica Raiche remembered the early days of aviation as a tremendously exciting and interesting period. But she will take a modern transport plane any day in preference to the bamboo crate in which she gained fame.

"The only good thing about the old days was the splendid spirit and unquenchable enthusiasm of the experimenters. I do not say flyers, for so few ever achieved that breathless moment when their dream ship actually rose into the air. But I shall always remember the persistency with which my contemporaries attacked the problem of flight. To them goes the credit for the utility of the modern aeroplane."

Dr. Raiche, as she is addressed confidently today by young mothers with ailing children, was a Beloit Wisconsin leader in the younger set when she first heard of flying. In France men were doing brave things with new fangled contraptions that they said would "revolutionize the transportation of the world" and being a revolutionary sort of a miss herself Beloit's lively Bessica had to go see.

She found women flying in France. So she came back to America with a husband and a powerful determination to be her country's first lady bird. She and her husband learned all they could about aircraft by attending air meets. There was not much to learn as the industry was strictly on a basis of every man for himself. No plans for plane making existed, no instruction courses in flying were available. You built your ship, incorporating your own ideas, and if it flew—miraculous.

The first Raiche plane was built in the living room of their home at Mineola, Long Island. Here the Wright brothers were working out experiments. Lincoln Beachey, Claude Graham-White and others were struggling along. By some happy combination of circumstances the Raiche plane flew. Flying in 1910 was not as we understand it today. The pilot who achieved fifteen feet in altitude and remained aloft for several minutes was an endurance champion.

Bessica insisted on piloting the first ship and, as women will, made her point. Despite the sage advice of non-flyers she stepped onto the wing of the plane she had aided in constructing and in the dead calm of an early morning became our first aviatrix on September 16, 1910. The first flight made without incident, she persisted but cracked up badly on her fifth attempt in the same day.

She repaired the plane and ten days later was back at the controls in the first exhibit of "What the flying woman wears." She had found that ground trailing skirts were no aid to the embryo flyer and appeared on the field, much to the consternation of old ladies of both sexes, in a leather jacket and riding trousers. Such daring created newspaper headlines.

"We built our planes on the principle that weight was taboo," Dr. Raiche says. "I was ideally equipped to be a pilot as I weighed only one hundred pounds. We used bamboo struts, China silk wing covering and bicycle wheels because they were the lightest things we could find. Common practice called for the use of stove wire for supporting members but my husband created a sensation by using piano wire, lighter and stronger.

"The motor of my personal plane was made by taking a common marine motor and boring and cutting away every ounce of surplus weight. We spent hours taking a few ounces from the crankshaft by drilling. The motor was only forty horspower.

"My complete flying instruction consisted of a mechanic placing the wheel in my hands and saying: 'Pull it this way to go up and that way to come down.' As a throttle control was unheard of a group of volunteers held fast to the wings while the motor was driven at top speed. Then they let go and theoretically one flew.

"Coming down one shut off the motor

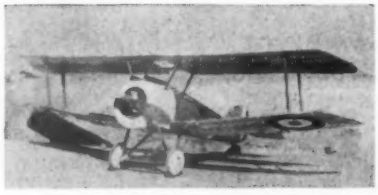
(*Continued on page* 55)

What the Model Builders Are Doing

A collection of airplane models built by readers of Popular Aviation.

OUR request in the May issue of POPULAR AVIATION for pictures and descriptions of model airplanes met with immediate response. An avalanche of pictures and letters immediately descended upon the editor and as we go to press with this issue the flow has not abated.

We have been saving some of the photographs and letters for this page with the idea of giving a "break" to followers of the model airplane hobby.



A. J. Hoover's Camel.

FROM A. J. Hoover of Tonganoxie, Kansas, came a picture of his Sopwith Camel. Referring to this photograph, he says:

It is built to the scale of 1" to 1'. I drew the plans myself. It has a span of 28", length of 18¾", and weighs about 5 oz. I have made flights of about 150 feet with it.

I also have constructed models of the Fokker D7 and of Rickenbacker's Spad fighter. I drew the plans of these myself. I scaled them from drawings appearing in wartime aviation periodicals.

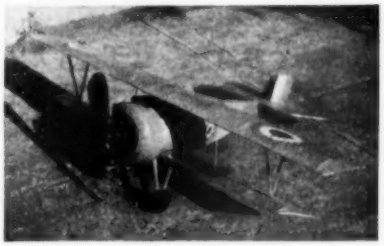
ORLAND JACK of Waukegan, Mich., sent an excellent picture of his Boeing and Hawk models, but failed to furnish any data about either the models or himself. A study of the photo, however, shows these planes to be beautifully built and exact in all details.

Runo Johnson's Hawk P-2.

ONE of the most complete and detailed models we have seen is Frank T. Roberts' 24-inch "General Aristocrat." It is well worth the time and patience spent on the work, if you should ask us. But read what he says:

Norman P. Marengo's Fairchild.

The model was built from detailed plans drawn by me and checked by the manufacturers. The plane model has a fuselage built of brass rods soldered to represent the steel fuselage of the large plane. It has a lead motor (each cylinder cast and fastened to crankcase), a swivelling tail-wheel, leather covered seats, windows, opening doors, built-up tail and wings as in large plane and full controls worked by rudder pedals and stick, and wood prop (though in the photo it looks like steel). I spent over 300 hours on the darn thing.

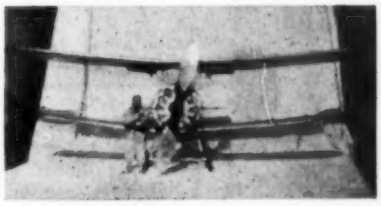


V. Pina's Nieuport Scout.

RUNO JOHNSON, who lives in Brooklyn, N. Y., submitted a picture of his Curtis Hawk model. It seems that Runo collaborated with a friend who lives in Massachusetts, but he didn't furnish the friend's name. The model is not a flying one, but is built to true scale, and is now in the display window of the Massachusetts Air Terminal and Arena.

Alfred Federman's S.E. 5.

AND from far-off London comes the picture of a model Bristol Bulldog fighter. With their fondness for unusually powered models, the British turn out some jobs such as are rarely seen in the States. This one, for instance, is run by clockwork. T. H. Gillett (at least we think those are the initials) is the builder. He says:



T. H. Gillett's Bristol Bulldog.

This model is complete in every detail. It carries the man standing before it for 100 yards, in spite of its weight, after being catapulted from the ground. The man, by the way, is jointed, properly clothed and has a carved face to make him very realistic.

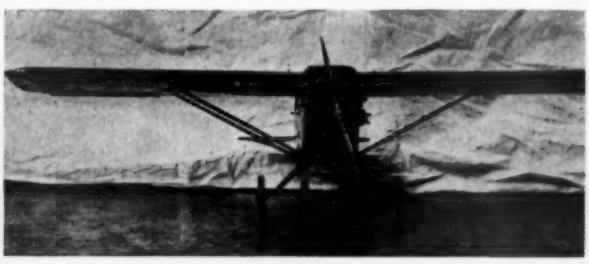
OF three photographs sent by Willard Rowling of Detroit, Mich., we selected the Douglas mail plane. Willard thinks he has the smallest model airplane in the world, a Lockheed Vega. Here is his letter:

Willard Rowling's Douglas.

I have what I think is the smallest airplane in the world. It has a half-inch wing spread. It is a model Lockheed Vega. It is so small our camera will not take it. I specialize in small planes. I have built many small models under five inches.

(*Continued on page* 61)

Orland Jack's Boeing and Hawk.



Frank T. Roberts' General Aristocrat.

MODEL DEPARTMENT

How to Build

the

NIEUPORT SCOUT

by

JOSEPH S. OTT

After you have finished building your Nieuport Scout from these plans, send a good photograph of your model to POPULAR AVIATION. Write a brief letter telling what you think of model plans published to scale but without actual dimensions.

In conjunction with Mr. Ott, POPULAR AVIATION is offering prizes for the ten best photographs and accompanying letters submitted. 1st prize: $10 worth of model supplies. 2nd prize: $5 worth of model supplies. The next eight winners will receive a full year's subscription to POPULAR AVIATION.

BECAUSE of the tremendous demand for war planes we are this month publishing a French plane, the Nieuport Scout. In October, 1930, a description was given of an SE-5 which was an English pursuit plane. The German Fokker Tri-plane appeared in the May issue, and in the future we are endeavoring to cover other models that were famous during the World war, thus presenting a complete series of pursuit planes.

It may be interesting here to give some of the characteristics of the flying scale model:

1st. The appearance and outline should represent the large plane as closely as possible.

2nd. This does not mean that the interior construction should necessarily be followed as closely as possible to the construction of the large ship.

3rd. Because of the flying requirements, certain deviations must be made in relation to the position of the wing, the gear, and the size of the propeller. It is invariably essential that the flying scale model has the wing farther back from the nose of the machine than the real plane.

4th. This should not be considered a detriment in the model's appearance as compared with the big plane. It should be remembered that we are building a flying scale model and not a true scale model just for looks.

5th. In a true scale model you would necessarily copy the colors, the interior construction work, the operation of all the controls, the motor, the correct placement of the wings and detailed units, also the position of the struts and the landing gear. This true model would be very pretty, but the flying ability would not be a desired feature.

6th. During the last few years quite a few models have been built from solid wood. These have been classed as true scale models, although the interior portions of the planes were eliminated. Still the external appearances were true to scale and the resemblance to a large ship is excellent.

Above we have classed three types of scale models and we will let the reader choose for himself just what type could be classed a *true scale model.* In my opinion, it is not a good policy or always important to keep to a set rule if you are constructing a flying scale model instead of a true scale model that is non-flying.

A lineup of Nieuport Scouts at a French airdrome during the World War.
Photo R. R. Martin, Hollywood.

SO far all the biplanes that we have published have had movable wings both for the upper and lower panels. This model has a stationary upper wing and the lower wing is adjustable with the clip arrangement. This permits its use as a parasol.

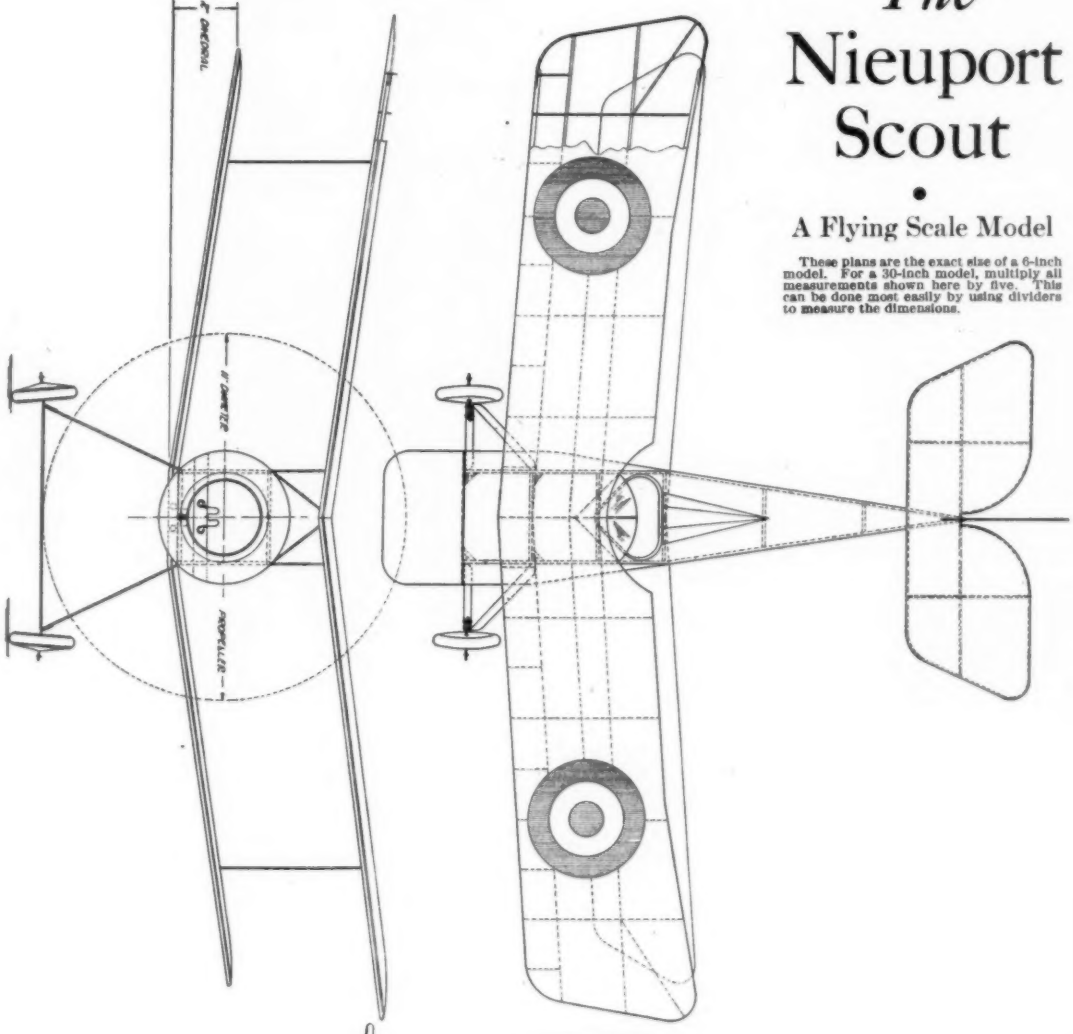
Following is a list of the materials needed to build this Newport Scout:

No. 1. Body—10 pcs.—3/32"x3/32"x 30—Balsa.
No. 2. Tail—2 pcs.—1/16"x¼"x15" —Bamboo.
No. 3. Landing gear—2 pcs.—1/16"x ¼"x15"—Bamboo.
No. 4. Struts—2 pcs.—1/16"x¼"x15" —Bamboo.
No. 5. Wheels—2-2" diam. Celluloid.
No. 6. Propeller — ⅝" x 1" x 11" — Balsa.
No. 7. Fittings, piano wire—diam. .029.
No. 8. Rubber motor—10 ft.—⅛" 30 gauge.
No. 9. Motor stick—3/16"x5/16"x15" long—Hard Balsa.
No. 10. Spars—3 pcs.—⅛"x3/16"x30" —Balsa.
No. 11. Entering edge—2 pcs.—⅛"x ⅛"—Balsa.
No. 12. Tailing edge—3 pcs.—1/16"x ¼"x30"—Balsa.
No. 13. Rib stock—Balsa 1/32" or 1/16" sheet stock, approx. 2x30".
No. 14. Tissue—3 sheets—18"x24"— Super Fine.

The Nieuport Scout

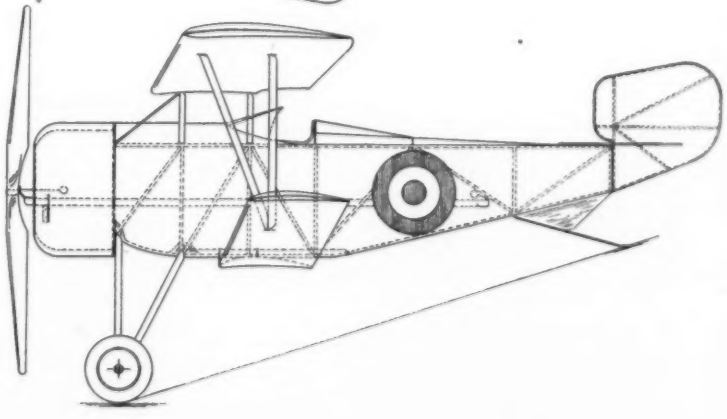
A Flying Scale Model

These plans are the exact size of a 6-inch model. For a 30-inch model, multiply all measurements shown here by five. This can be done most easily by using dividers to measure the dimensions.



Color Scheme

Wings	White
Body	Green
Tail	Yellow
Struts	Black
Wheels	Red
Rudder	Blue-White-Red
Decorations	Allied Circles



No. 15. Cement—½ oz. unit.
No. 16. Glossy lacquer, black—for struts.
No. 17. Glossy lacquer, aluminum—red for propeller.
No. 18. Banana liquid—Small can.
No. 19. Allied war emblems.

. *Abbreviated Building Instructions* .

No. 1. Building the left and right side of the body.
No. 2. Assembling the body sides—Cowling.
No. 3. Nose—Cowling.
No. 4. Landing gear—Wheels.
No. 5. Tail skid.
No. 6. Stabilizer.
No. 7. Rudder.
No. 8. Upper wing—Ribs and nose ribs.
No. 9. Lower wing.
No. 10. Lower wing—Wing Brace.
No. 11. Lower wing clips.
No. 12. Motor stick.
No. 13. Propeller.
No. 14. Clip for motor stick.
No. 15. Covering the body.
No. 16. Covering the wing cowling.
No. 17. Covering the tail units.
No. 18. Covering top wing.
No. 19. Covering the lower wing.
No. 20. "V" struts—Center section struts.
No. 21. Windshield.
No. 22. Guns.
No. 23. Decorating.

Body—No. 1 and No. 2

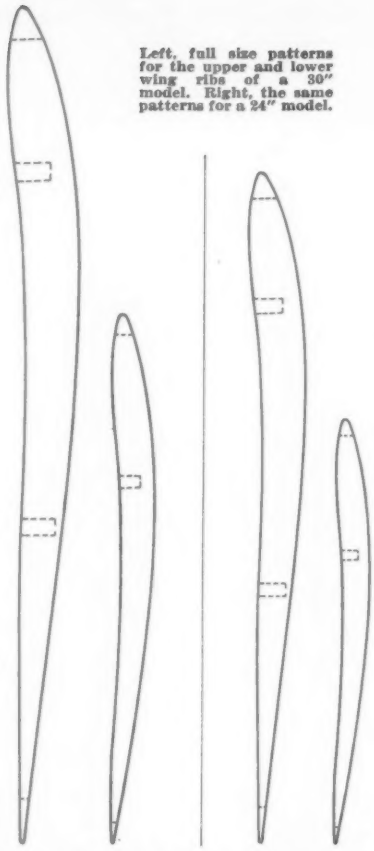
All details to follow in step with the abbreviated instructions so that direct reference may be made from the detailed instruction back to the abbreviated instructions.

A full size layout should be drawn on the board and the two sides built on top of each other, with some pine to hold it in place. After the sides are completed they may be separated with a razor blade, cutting the joints that have been cemented together. They are separated left side from the right side.

When the two sides are complete and dry, assemble the top piece first and later the lower side. This side may be held on a table upside down while the part of the work is progressing, allowing the complete body to dry in this position so that no warping gets into the straight high top longers.

Cowling—No. 3

The cowling in this instruction is similar to the N. A. C. A. type, and is not cut away in the lower sides like in the triplane model. A front ring and a rear ring are cut out first, preferably from some thin plywood, if this is obtainable. Approximately 12 formers



Left, full size patterns for the upper and lower wing ribs of a 30" model. Right, the same patterns for a 24" model.

are used, spaced about equally front and rear ring.

Landing Gear—No. 4

The landing gear is made of bamboo. When joining to the body allow approximately 2" additional material so that more surface is obtainable in cementing to the joint along the side of the strut at the body. The wheels are 2" standard size and should be red, as called for in the color scheme.

Tail Skid—No. 5

Not much explanation is necessary for this part of the model. When cementing into the body before attaching put a fairly thick piece on the body so that the skid may be pushed into the piece of balsa and in this way held more secure.

The rear part of the skid is also forced into the rudder, and where it meets the front part the skid should be tied with a few turns of thread. Parts that have to take a lot of shocks and bumps should always be tied on with a few turns of light silk thread.

Tail Units—No. 6 and No. 7

The stabilizer and rudder are made of bamboo bent into correct shape completely assembled, and then cemented on to the body. If you desire to use balsa and believe that you can do as pretty a job, proceed as you see fit.

Wings—No. 8, No. 9, No. 10 and No. 11

The wings on this model are similar to those in preceding articles. They should be carried out as in any other construction, and the ribs would naturally be the easiest parts to be cut out, arranging them to their proper length and building the left and right side so that the ribs follow in a straight line.

Everything in the wing is assembled into one piece and after the dihedral and sweepback are built into it, the lower wing should be followed through in the same manner. Do not forget that the clips which are used to attach the lower wings are firmly cemented. One is cemented to the leading edge and the other to the spar. This allows the lower wing to be adjusted for correct position.

Propeller and Motor Stick No. 12, 13 and No. 14

The propeller and motor stick have also the same design and description as in previous issues. As most of the model builders that are instructed in scale models have more than the average amount of intelligence along this line, we are going to pass along without any detailed instructions about these two subjects. In fact a motor stick and propeller are usually the first step for any model builder of any experience. The clip for the motor is cemented on a cross brace and this in turn is put in the cowling approximately one inch back from the beginning of the small ring of the cowling.

Covering—No. 15 and 16, No. 17, No. 18 and No. 19

The body of the model should be the first to be covered, for upon seeing this part completed, it encourages one to try and make the covering on the wing as near perfect as possible. Before covering the wing, cement a small piece of cork at the points where the struts are attached to hold the upper and lower wing together.

A cork is used in this instance as it seems to hold and grip the pins very firmly. In fact, it seems to exert a pressure against the pins at all times. This is not the case in balsa wood or any other material that is usually used.

"V" Struts—No. 20

Now the "V" strut has been left for this period of the construction, as it is much easier to set and assemble these when the two wings are completely finished and in place on the fuselage.

Windshield—No. 21

A small piece of cellophane or kodak film fairly heavy is suitable for a windshield. It is a good idea at all times to have a windshield on a model. It sort of completes the structure, putting the last finishing touch in place.

Guns—No. 22

We do not show a gun, but pictures have from time to time been shown in this magazine. These would give one

A view of the beautiful finished model. Worth building, isn't it?

Future model designs by Ott will include: Camel, Spad, Boeing Fighter and Albatross. Watch for them in Popular Aviation.

a good idea of their construction. These are not necessary, but also just used to increase the interest and value of the model.

Decorating—No. 23

When covering the model, the color scheme may be carried out as described. This will make a very flashy model when completed. Of course, it is not essential that you use the color scheme that we have, but we think it will make a very pretty model if carried out and worked into completion.

Flying the Model

We have given quite a few instructions on how to fly models, but nothing in the world will teach one better than the actual experience of taking it out and gliding and adjusting it for flying.

Action Photos from Model Meet

"On the line" at the model meet.

THESE pictures were taken during a model plane met in Bergenfield, N. J. The Invincible Model Aero Club was sponsor of the meet which attracted many of the local model enthusiasts.

Twenty planes were entered in the various events. The smallest was a

A contestant shown a second after releasing his model.

one foot Robin and the largest a six foot Fairchild. The latter weighs 18 ounces and has a speed of 17 m.p.h. Its stalling speed has been as low as 7 m.p.h. It flies 17 feet handwound.

An Early Air Meet

(*Continued from page* 12)

ingenuity and speed to rescue not only Aiken but also his pilot.

The pilot had now to his horror become aware of the fact that the man was hanging from the end of that rope, powerless to get back upon the wing on account of the windage being too great for his strength to overcome; then he realized that the coldness must have caused numbness, and finally unconsciousness.

He could not land without dashing this man to death; and if he should attempt to land it was practically certain that the weight of the man dragging on the ground would nose the plane over, crashing it, and probably killing him too.

In desperation the pilot of that plane flew it steadily for forty-five minutes, 'round and 'round, while some means could be devised to take that man from the end of the rope. There was also the ever growing fear that his gasoline might give out before assistance came.

It was finally decided that Shirley Short should go up in a two-place plane with an assistant who was a professional parachute jumper, and endeavor to fly under and near enough to the helpless man to allow the assistant, out on the wing, to pull him onto the wing and cut the rope.

Just as they were taking off an incoming plane with passenger crashed almost head-on into them on the ground, but with no one hurt. Nothing daunted, Shirley and his helper jumped into another plane, flew up and under the unconscious man, and by nothing short of miraculous flying on the part of both pilots—as it was almost dark by this time,—"Shorty" Aiken was rescued and loaded into the fuselage; he was brought to earth where an ambulance awaited, and borne to the hospital where he was confined for several days.

The pilot from whose ship he had made his spectacular fall brought his ship down in safety, but he was in a state of utter collapse and unable to get out unassisted.

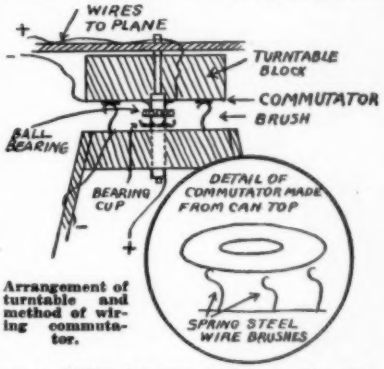
We all returned to our hotel feeling that never would any of us countenance any such fool stunts, so entirely alien to aviation in any form, which had so nearly caused a tragic ending to an otherwise successful and enjoyable air-meet.

The Whining Bullet

(*Continued from page* 16)

assemble the turntable on the stand and hang the model on the hook.

The "Whining Bullet" is ready for its first test hop. Carefully balance the turntable by sliding a weight, such



Arrangement of turntable and method of wiring commutator.

as a sledge hammer head, on the projecting arm. The model should just touch the ground.

Ready? Switch on?

Give her the gun!

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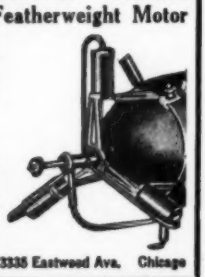

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WOMEN'S ACTIVITIES

EDITED BY LADY MARY HEATH

May 9, 1931.

THE Detroit Aviation Show was noteworthy for the attendance of women pilots. One of the most interesting days at this very excellent show was the Woman's Aviation Day, Thursday the 17th of April. Mrs. Orra Heald Blackmore was hostess to all the visiting women present to a delightful lunch, and there were free passes and rides to the show after. Mrs. Blackmore is President of the Woman's National Aeronautic Association.

Lady Mary Heath.

* * *

Miss Ruth Nichols, who holds the women's world record for altitude flight as well as the speed record, was also present at the show. Her altitude record has come out at 28,743 ft. She put up her speed record during the show on Mr. Crossley's Lockheed Vega. This was the machine she used in her altitude flight as well as her transcontinental speed record which is only one hour above the men's.

It has also been said that she is going to attempt a transatlantic flight in this machine. I deeply and sincerely hope that she will not attempt this, as she has not the long nightflying and airmail work necessary for the success of this undertaking.

* * *

Miss Frankie Renner, secretary to the Robins Flying Services, Akron, Ohio and Miss Eleanor Smith made attempts to beat the altitude record. Miss Smith unfortunately lost consciousness at 26,000 feet, and had an accident at landing her first time. It was thought that her second attempt had beaten Miss Nichols', but hers and Miss Renner's had failed to do so.

* * *

Mrs. George Palmer Putnam (Amelia Earhart) attained a height of 18,415 feet, recently in an Autogiro. This is an altitude record for this type of machine.

* * *

Miss Dorothy Hester also visited the show with Mr. Tex Rankin, her instructor. They both hold records for the outside loop. She has done 62 in succession.

* * *

Forty British women now have their own aeroplanes.

* * *

A new body has just been formed of women pilots at Washington. Mrs. Opal Kunz of New York, who did such fine work for the "99 Club" has created the "Betsy Ross Corps" to assist in national defense. An honorary member, Major General James E. Fechet was present at the Memorial Central Hall, where it was founded on May 9th.

Among the other important guests and speakers were Rear Admiral William A. Moffat, Second Assistant Postmaster General Irving Glover, and Mrs. Lowell Fletcher Hobart, President General of the Daughters of the American Revolution. Mrs. Eleanor Washington Howard a direct descendant of George Washington presented a flag to the Corps which was received by the famous aviatrix, Miss Marjorie Stinson.

* * *

Amelia Earhart Putnam was the principal speaker at the Barnard College Athletic meeting at their gymnasium on May 8th. Many track and other athletic awards were given to lucky recipients.

* * *

Miss Ishbel Macdonald, daughter of the Prime Minister of England has just started her flying instruction at the Brooklands School in England. She is said to show great aptitude.

* * *

There are now 408 licensed women pilots in the United States. Fifty-three are licensed commercial pilots, 36 are transport pilots, one is a commercial glider pilot, five are mechanics, and the rest are private pilots.

* * *

Free aeronautical lectures are being provided by the women flyers of Kansas City. Seven aviation experts are scheduled to speak there.

* * *

Miss Delphine Reynolds, of England, daughter of Sir James Reynolds M. P., has left in a Blackburn Bluebird to fly down the West Coast of Africa with a very fine pilot-navigator Mr. W. G. Pudney, late instructor to the Royal Canadian Air Force. They have had a number of vicissitudes, including being rammed by a river boat at Gambia, and a swarm of bees lodging in one of their wings. It is feared that they may have to abandon their flight owing to damage caused to their machine by taking off at Sierra Leone in very choppy water.

* * *

Mrs. Laura B. Harney, faculty member of the Aeronautics Branch of Washington Junior High School, Mount Vernon, New York has just flown to Boston on aviation business through the courtesy of the Curtiss-Wright Flying Services.

* * *

Miss Ann Harding, the beautiful motion picture star who is learning to fly on her own recently purchased Bellanca has now completed a rapid journey from Detroit to Hollywood. She is said to be an excellent pupil.

(*Continued on following page*)

Women's Activities

(*Continued from preceding page*)

The coming season presents great racing interest to women pilots. While visiting the headquarters of the Federation Aeronautique Internationale last September, the secretary told me that not alone have they no rule whatever against women racing with men, but they encourage it in every way possible. The fine example of Miss Winifred Brown winning the King's Cup Air Race in England last year is a good example of this.

Mrs. Keith Miller tells me she has purchased a Laird machine for racing this season. The following events are scheduled:

June — Third Annual Michigan Air Tour.

June — First Annual Aviation Country Clubs Seaplane Cruise on Atlantic Coast.

July 4 to 25th—Probable date of National Air Tour of 1931, Cleveland, Ohio.

August 23 to Sept. 1st—National Air Races, Cleveland, Ohio.

* * *

Amelia Earhart Putnam is having a busy time of it these days. She has just been made a vice-president of the N. A. A., and now we receive word that she has been engaged to give sixteen addresses throughout the country for the Exchange Clubs. The lectures start June 1st and will be given three a week. She will talk on the autogiro.

Sprouting Wings

(*Continued from page* 28)

I wish I could see a chart of that flight. Up and down; right and left; and I was trying hard. But I did get there.

"Always be looking for a place to land. See that field over there, the one that looks almost white? That isn't planted and would be soft—might nose you over. A green one is better—a wheat or cotton field." How you could pick out a cotton patch from fifteen hundred feet I don't know. A respectable creek looks like a dark thread. But there must be some way.

"Stay away from the mountains. Stay over the fields. See those two level fields right up in the foot of the mountains? Dandy landing places." All this talk of landing gets on my nerves. I don't want to land; I want to fly.

"See that field just beyond the green one? See the ditch running through it? That's what you want to look out for. Never go into one that looks like that."

Back to the field again, I practiced on my first landings, taking off, circling, and coming in. It takes less than five minutes to do it. It seems so long, getting down after you cut the motor. I want it to come on down. I don't have any idea how high I am. Twice we were on the ground before I knew we were within twenty feet of it. I suppose that is one of the things that will "come natural after a while," but it is hard now. It sure is fun, though.

Lesson 5

TODAY we did a few banks and turns and made ten landings. I can't tell where the ground is. Derry says I will have to "feel" it before I can land. I am afraid that, if I were to try it alone now, I would "feel" it before I expected to—and that would be that. Taking off doesn't seem to be so hard, but I always seem to aim right at the hangar or a field light.

When we came down Derry said, "Well, you weren't so bad, considering. Ought to use a little more rudder coming out of your turns. Anything you want to ask?" I asked him if it is natural to feel so dumb, and he said it is, so I feel better. I have wanted to fly so long and so hard that I thought it would come sort of natural. I'm not as smart as I thought I was.

Lesson 6

I KNEW I was in for it the minute I came in sight of the field. Derry had the ship up and was cutting all kinds of capers. "Well," I thought, "he is either working off a mansized rage, or he is feeling too good for comfort." I couldn't decide whether his coffee was scorched, and his favorite shirt in the wash, or whether he had just discovered a long-lost millionaire uncle. But whatever it was, it looked like a big morning. And it was.

"How do you do a right bank?" asked Derry, unbuckling his helmet. I gave him what I considered a thorough and accurate description. "Yeah," he said, "you're getting good. That's a wingover. How do you feel?"

"Fine."

"All right. We'll see. We are going to be up forty minutes and we won't be straight more than three of them."

He was as good as his word. In the next two minutes man's dream of an airplane that will rise straight up was almost realized.

"Now, you just sit tight and follow through. I'm going to do a few little things." So I sat back as tight as possible, and he proceeded to "do a few little things."

And about that time I looked up and saw the ground.

And, seeing the ground in that unexpected position did something to my stomach. It left its old, familiar moorings to soar well ahead, dragging me sickeningly after it; then it fell back and sunk and sunk until it was ten light years behind my backbone. Then, back it came with a thud, and my head felt as light as ether and my feet weighed ten thousand pounds apiece. They were tied down with iron chains.

Besides the queer feeling (anatomically) it gives you, it is quite a shock to think that you have bought a good, reliable service plane, and suddenly awake to the realization that you have been sold a trick circus plane that can turn handsprings, walk on its hands, waltz and two-step.

"Now," said Derry, "pull her back to fifteen. Got it?" I had it. But I didn't have much interest in it. By this time, I presume, the ship had been straightenend up. I had not—entirely.

"You do a few banks and turns and then I'll show you something new." I took it, and the term "gentle bank" took on a new meaning. They were probably the gentlest banks ever made.

"Now this," said Derry, "is what causes more accidents than anything else. We are going into a stall and I'll show you how to come out of it. Pull her nose up—up—up high—up ——" I thought I was pulling it up, but Derry pulled the stick back and held it there. We went up until the motor began to feel kind of useless and I had an awful feeling that something had to be done, and quickly. A helpless, hung-in-the-air feeling. I wondered if Derry had frozen to the controls.

"Now, it's stalled. There's only one way to get it out. Push her nose down and hold it there till you get some speed. Hear those wires sing? Now, straighten out." We did some more, and Derry wiggled the stick to show me how useless it was. We fell off forward, and to the sides. Then, he told me to do one. I held it up as long as I could stand it.

"You didn't stall. Almost, but not quite." And I pulled her up and held it there and stalled it good and proper.

After that, it wasn't so bad. We even flew straight a couple of minutes on the way down.

Lesson 7

WE HAVE had a month of terrible weather. Everything frozen. I flew this morning for the first time in

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four weeks. I was just beginning to learn something when we had to stop. After about thirty minutes of flying, it begins to come back, and I relaxed a little, but I felt queer and stiff the whole hour. It is cold and the wind comes in between my jacket and pants and freezes my backbone.

We did a few landings, but mostly air work.

Lesson 8

FORTY-FIVE minutes of landings today. I wonder if I ever will learn to set one down. I am too short, for one thing. When we come in to land, the rudder seems to be the most important thing, and when I stretch out to reach the rudders I can't see out, and when I sit up straight to see out, I can barely reach the rudders. That may be just an excuse, though.

Lesson 9

TODAY I spent most of an hour trying to make circles and figure eights. I got quite a shock, as well as a bump, when I crossed my air track the first time. I didn't know you could make a track in the air. I have been told that air is a definite form of matter, but I've always thought of it as a limitless expanse of nothing at all. However, when you actually cross your own air track and experience a bump comparable to crossing a rut in a dirt road, it is easier to believe.

After the circles we began on eights. "See those two oil derricks over there?" asked Derry. "Fly over there and I'll take you around a couple of times and then you can have it." He did three or four and turned it over to me. "Remember to get the derrick at a certain point under your wing and keep it there."

I started off pretty well. There was the derrick under my left wing; but pretty soon it was away over to one side, and then, when I tried to correct it, it disappeared altogether. That part of the eight being beautifully ruined, I started for the other point. I banked too soon and circled over a cow pasture —which is all right, if that is what you are aiming at, but I couldn't pan it off on a bright boy like Derry for an oil derrick.

I tried and tried. The idea of making a figure eight sounds sort of flowing and easy. But when I tried them, they humped out on the northeast corner, or leaned precariously over toward Jones'.

Sky writers have certainly gained a lot in my estimation.

Lessons 10, 11 *and* 12

THE last three hours we have spent almost entirely on landings. And two times today I got what I believe Derry means when he says "the feel." I felt it settling down and the motor seemed to get tired and not able to do any more about it, and Derry said real quick, "down," and I pulled the stick all the way back just as we were on the ground. It's a wonderful feeling. Why, I wonder, can't I get the feeling every time?

Lesson 13

ONE hour today—mostly landings—and I never did know what it was all about. Not once. I couldn't even *see* the ground. And I felt so sure, when I went out, that I was just going to do wonders.

Finally I said, "Derry, you take it around, and let me just try to see the ground."

He turned around, pushed back his goggles and said, "Do you mean to tell me that you have been landing for thirty minutes without seeing the ground?"

I can usually fly better just after Derry has been flying. He does it so well, and easily, that it kind of inspires me. But even that didn't help today. I am begininng to wonder if I just don't have enough sense to learn. Here I've had ten hours and a few minutes and I wouldn't dare solo. Even if Derry would let me—which he wouldn't. I must be getting old or something.

Lesson 14

WE WENT up for some air work today. Derry said that maybe we have been working on landings too hard. We did some wingovers, reverse banks, stalls and dives. I like being away up high. I think Derry likes it, too. At least, it inspires him to conversation. It almost seems that the higher we are the more talking he does.

I never have tried it, but I feel fairly positive that I couldn't make a very good speech at the moment when I am upside down and beneath me is a terrifying expanse of nothing at all, which ends abruptly in a very hard and definite form of matter known as "earth." But does that faze Derry? It does not.

Lessons 15 *and* 16

TWO more hours of landings. I think I am improving. In fact, I know I am, but I am almost afraid to say so. Most of the time I know where the ground is, if I don't always know just what to do about it. But I never can tell when I am going to fall in for one of these wild ones, and hit wheel first for an awful bounce.

Derry asked me today if I wanted to try it alone. I told him, "No." I know better than anybody how bad I am. I might luck in for a decent landing or two, and then again I might not.

I recommend learning to fly for everybody who feels right cock-sure of himself. I remember saying, "I don't think it will be hard to learn. I know I am a good car driver." Yeah, and I suppose that is a good reason why our cook should think she could qualify for a golf professional.

Lesson 17

ANOTHER forty-five minutes. I believe Derry thinks I am a terrible scaredy-cat. Maybe I am, but I don't see any reason to rush. I have the plane and Derry is always there. Another three or four hours can't hurt me —and it might help a lot. I have a family and a husband to raise, and I've always looked forward to being a peaceful, white-haired great-grandmother. I do like to live.

Lesson 18

THE air was just right today—cool, but not cold, with a sweet little breeze out of the southwest, so that I could sit down right over the fence on a broad, smooth strip.

After three landings I stopped and said, "Get out, Derry, I've got the urge." And Derry climbed out, taking his cushion with him.

"All right," he said (his teeth were almost chattering, and it could not have been from the cold), "if you don't feel right when you come in, just gun it and go around again. You'll be O. K."

I took off. When I began the turn, I wondered why I wasn't scared. After that, I was too busy to wonder anything. When I took off the third time, I felt curiously elated. I wanted to burst out in that old negro spiritual:

"I got-a wings,
You got-a wings,
All of God's children got-a wings."

They weren't perfect landings, not a perfect three-point one in the bunch. But I did walk away from them.

I have sprouted wings. They are weak and they are wobbly, but they're wings.

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A Double Fight for Life

(*Continued from page* 34)

mind a few things like that to get safely back to the good old earth, from which you had risen so swiftly a short while before. What's a little mud and water to an aviator! Nobody minds mud and water. Or do they?

Consider yourself in Allen's predicament. Above him spread a great mushroom of fabric and from it stretched a score of ropes, terminating in a harness buckled over and around his body. Dangerous ropes! And just below him—not very far below now—lay that brown, ugly, mucky pond—soft, sticky, engulfing.

Allen was bound to land with a thud. If you don't happen to know, it is estimated that a parachute jumper lands with the same amount of force as would a person leaping off a ten-foot height without any sustaining element, like a parachute, to relieve him.

The equivalent of a ten-foot jump into that gooey mud was what faced this flyer.

"I was drifting toward the center," he explained afterward. "I tell you I got another good scare. All I could see was myself getting tangled up in the 'chute and drowning in that muck."

But it was no time to give way to fear. Allen got busy. Once more he fought frantically to escape death. The peril of the air had become a peril of the earth. If Allen won through, he would have to fight, and fight hard.

He grabbed the ropes on one side of the 'chute and tried to sideslip away, but it was no use. He saw he was going to land in the stuff, anyway. His only hope lay in the possibility that he could disengage himself quickly enough when he arrived.

With a *plop!* he hit it.

"My landing was soft," he said. "But I went shoulder deep into the mud. Then the 'chute jerked. It yanked me over to an angle of forty-five degrees. The wind was blowing hard. The 'chute dragged on me awfully. But for a few minutes I seemed well stuck."

LOOKING back at is afterward, Allen believed that the drag of the 'chute momentarily helped him, for there was nothing stable in that mud on which he could rest his feet. In a measure the 'chute supported him there as it had in the air. It probably saved him from going under. But every second the danger grew that he would become entangled in the ropes, with the 'chute wrapped about him by the whipping wind, and smother to death in its folds or sink below the surface to die by drowning in that slime.

Still he fought on, almost blindly now, mud splashing into his face, his body being sucked under, water rising up to flow over his lips, his nose. Gasping, choking, straining, his feet churning under him like a mill as he sought a stable footing, his body being almost pulled apart by the clinging mud and the tugging yanks of the whipping 'chute, still Allen kept his head and fought desperately.

With a lull in the wind, he succeeded in spilling the air out of the 'chute. Raising himself by a mighty effort, he flung himself forward until he could get the harness off. Then to his surprise he found his feet touched a more solid support.

"I found there was a crust about knee deep in the mud," Allen said, "that would support my weight, except for an occasional break."

Floundering, staggering, half overcome, blood still seeping from the wound in his head, he had suffered when the engine flew off up there in the sky, he made his way toward the edge of the pond. It seemed like miles to him to go. The time was eternity, though it really took him a half hour.

Often he thought he could not go on. Often he thought he must collapse and sink back into the ooze. But again and again he drove forward. And the entire distance, that seemed like an endless path to him, was hardly a hundred yards to solid ground!

Somehow he made it. At last his feet reached firm earth and he threw himself, exhausted, on the bank. Lying there a few minutes, he got his strength back again, and, as is instinctive with all aviators, he bethought himself of his plane.

The ship had crashed on the embankment of the pond opposite where he lay. He located it after a while, when he cleared the mud from his eyes and could see. He climbed to his feet and made his way wearily down the railroad tracks, around to the other side, to give it the "once over."

Meanwhile a wrenched back provided him plenty of grief. Every step he took was painful. He found the ship eventually and saw there was nothing he could do about it then. So it was with joy that he observed a car drive up not far away, a hand wave to him and a voice inviting him to climb aboard.

He had to be helped into the machine and he had little sense of where he was taken.

But it turned out to be the proper place for him. It was the Navy Yard hospital where he arrived. And he needed it.

The doctors and the orderlies were ready for him. Somebody had telephoned ahead and there had been plenty of observers. They would have got to him before, only he chose the most inaccessible place in the whole locality to come to earth.

But they started to work on him. They cleaned off the heavy coating of muck. They sewed up a cut over his right eye. They punched and poked him for breaks, but they couldn't find any, and, marvelling, they went over him again to be sure.

At last they let him roll into bed—and how good it felt! Allen said he never knew a hospital bed could feel so soft, so downy, so comfortable as that one into which his weary, battered frame seemed to sink for miles.

"The very good treatment they gave me," he remarked later, "probably saved me from a case of blood poisoning from the filthy muck that was smeared into several cuts and abrasions on my hands and face. And, believe me, that muck certainly was dirty stuff. Thank heaven, the hospital was handy!"

It was some time before the engine could be located, but after a continued search, somebody discovered it about six or eight hundred yards from the plane, embedded in the ground about four feet deep.

All the internal parts were found in the crankcase. Two of the metal blades had been twisted and bent but were still in the steel hub. The third blade was broken off about an inch from the hub and never was found.

"It seems certain," said Allen, "that the accident was caused by the breaking of one blade of the propeller when I started the engine full on. With the breaking of the blade the propeller was thrown out of balance so much that the engine was torn from the mount."

Take it from Allen, this business of joining the Caterpillar Club isn't something you look forward to eagerly. The initiation ordeal is too exacting. It takes too much out of you.

If it is forced upon you, that's one thing, he says. But it isn't something you go after, like waiting around the college campus in the hope that Skull and Bones will tap you for membership in that fraternity. Allen got tapped on the skull, all right—and the doctors looked over the bones.

Allen found himself proposed, passed on and elected all in the space of a few minutes. By the time he had quit floundering in the mud, he was a full-fledged member of the Caterpillars. And a very wet and dirty one, too.

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I Photograph the Enemy from the Air

(*Continued from page 25*)

good friend of mine, came to me one morning and said:

"Walter, here is my ring, my watch and a few other things. The ring was given to me by my mother for good luck, but it hasn't brought me any. Perhaps it will help you more than it did me, so wear it from now on. As for the other things, I wish you would arrange to send them to my mother. I know I'm going to 'get mine' today."

"Don't be a fool," I told him. "I'll hold these things for you, if you wish, but you'll be over that silly feeling by tomorrow."

"You may as well prepare to send that stuff to my mother," he stated. "There is not going to be a tomorrow for me."

Within the next hour he and his observer met an enemy combat squadron about a mile behind the British lines and were brought down in flames. I may be wrong, but I feel sure that Karl deliberately flew toward them and literally committed suicide, taking his companion to the same inglorious end. I still wear his ring, but I shall always feel that he treated the observer very shabbily.

Later I learned that he had received a letter informing him that his sweetheart was behaving in an unfaithful and extremely disrespectful manner. Somewhere in Berlin today, unless she has died or moved away, lives a woman who may read this. I hope she does.

For several days following the tragedy, I always inquired anxiously after my pilot's health and mental views of everything in general before climbing into my cockpit. Not that it would have made any difference in my going with him—orders were orders—but it was rather comforting to know that he still thought life was worth living.

PROBABLY the most difficult task ever given me was the job of mapping the territory around Compiegne, in the Amiens area, about thirty-five miles behind the English front. Two observing planes already had been sent on that mission and had failed to return. The fate of one never became known. The other, it was learned, had been brought down by anti-aircraft guns.

It was necessary that the ground forces have photographs of this Amiens area at any price, for they knew that the Allies had been constructing concrete reserve trenches and gun positions here since 1914. And so, with an escort of thirty fast Fokker planes, my pilot and I climbed into our Albatross and started out.

The Fokkers swept across the line at a height of about ten thousand feet while we rode some four thousand feet above them. Suddenly hell broke loose in the form of several squadrons of British combat ships. A moment later, one of the grandest dog fights of the air was being staged beneath us.

I wish to state now, for the benefit of anybody not aware of the fact, that most of the hottest air battles were the direct result of some observing plane attempting to go where it wasn't wanted. We observers were the bone around which many of the dog fights were centered.

Our Albatross slipped away from the scene and hurried on. We had our own duties to perform and couldn't stop to watch the battle. Arriving at the desired area, we retained our altitude of fourteen thousand feet and I got busy with my camera. The camera I used was of the graflex type with a trigger attachment operating similar to that of a gun. A jerk on this trigger took the picture, and another quick jerk on the plateholder reloaded the apparatus. There was no method of focusing, and very little need of it because, from the altitude at which we usually worked, the distance was "standard." The majority of the actual air photographs we took measured about five by seven inches. Incidentally, it was the photographer's business to see how much territory he could cover thoroughly in the minimum number of plates.

My work completed, we headed for our airdrome and, by taking a roundabout course, reached it without any trouble.

But imagine my chagrin when it was found that the finished pictures were entirely unsatisfactory, due to the fact that I had got clouds into them! The dog fight had been for naught, and the photographing would have to be done all over again! To put it mildly, I was reprimanded and informed that I would make another try on the following morning without an escort.

My pilot and I made the attempt as ordered, but were forced back. The British air squadrons near the front seemed determined that no German observation plane was going to cross the line that day. In the afternoon we tried to sneak across at another point many miles away but were forced back once more.

Which reminds me that I often have been asked "What was the best time of the day for an aerial photographer to make pictures?" The correct answer is "Any time he could get across, assuming, of course, that the visibility was favorable."

Early on the following day luck favored us. We stole across the lines and again reached the Amiens area. Far beneath us some anti-aircraft guns greeted us savagely, in fact, shelled us unceasingly while I did my work, but this failed to disturb us in the least. In those days, an aviator's chances of being brought down from a high altitude by anti-aircraft fire were so slim as to cause him little concern. I was highly concerned, however, with our chances of returning safely across those thirty-five miles of enemy territory to our airdrome.

But again luck favored us. We encountered no British planes on our way home, and the photographs turned out nicely.

I RECALL that spring day in 1918, when the baron Manfred von Richthofen failed to come back. We knew that he was never to return, for we understood that he had been brought down by machine gun fire from the ground. One ugly rumor, to the effect that he had been killed *after* his three-winged plane had landed, was circulating.

A day or two later I flew across the lines and photographed the airdrome where Capt. Roy Brown was stationed. Of course we didn't know at that time that Brown was the pilot who had brought the baron down in fair combat.

I was at our airdrome when the British squadron flew over to drop us photographs of Richthofen's flower-bedecked grave .We did not realize their purpose at first and our anti-aircraft guns opened fire on them. But when one of the pilots dived down and dropped a package, all shooting ceased instantly because every man of us sensed what that package contained.

Many of the sights I photographed from the air were fascinating, though far from pleasant. For instance, I snapped a French pilot who had just leaped from his flame-swept ship and was falling to his death. I got a picture of German infantry attacking a British tank at close quarters. I even photographed bursting shells that were directed at my own Albatross. Dozens of my best pictures were stolen from me before the war had ended.

Yes, we aerial observers played an important part in the war. Without us, the exact position of the enemy's batteries and his ground movements would not have been known. Without us, the ground armies would have advanced blindly. Our work was dangerous. We were "cold meat" for faster planes. And now—

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A Crack-Up Party

(*Continued from page* 20)

"That ambulance," asked the prospect, a trifle uneasily, "where is is going?"

"Just a test," said Capehart, smoothly. "The boys are timing their speed to the center of the field. Why, last week they actually beat the fire truck! Now just notice this instrument board . . ."

This time it was the assistant field manager who dashed by in a car, pausing near Capehart long enough to yell and point aloft.

"There seems to be a bit of trouble," said the prospect, looking aloft and losing interest in the plane he was going to purchase.

"Not at all, not at all!" said Capehart, watching them unreel a hose, while the assistant field manager frantically waved to Breese to attempt a landing near it. "That's the reception we sometimes give a visiting flyer here. Just some of the boys cutting up, you know. Innocent fun. Ha! Ha! Now, these ailerons are . . ."

But the prospect had completely lost interest in the plane and was gazing in fascination at the crowd of mechanics who were motioning to the low-flying Vance.

"If you'll pardon me for a minute," said Capehart, "I'd like to step into the Operations Office to make a call. Haven't been home since Friday night. The little woman, you know. Ha! Ha!"

He dashed into the Operations Office and whispered hoarsely to a young chap at the switchboard, "The works!"

"Oke!" said the chap at the switchboard, eloquently, and immedately got busy phoning another part of the field.

When Capehart returned to his sky-gazing prospect, he was once again carefree and unruffled. The prospect, however, was not. "Flying," said the latter, "is not half as safe as I believed. I don't believe I want to buy a plane and learn to fly it. Now, that poor chap up there . . ."

"Not at all, not at all," replied Capehart, confidentially, "it was supposed to be a secret, but since you've asked, they are taking some action shots for a new air picture. Now, if you'll just finish looking at the motor, we'll go out to the field and watch what happens."

Ten minutes later the prospect walked out to the field to see a cameraman busily grinding an empty camera, as Vance sideslipped gracefully into the field, skittered along the ground on one wing, and finally came to an ungraceful stop.

"There you are," said Capehart to the prospect. "Now what do you think of that?"

"Lousy," pronounced the prospect. "If I couldn't crack up a ship better than that for the movies, I wouldn't fly!"

"Right you are!" said Capehart, heartily. "They'll probably make him do it over again tomorrow. Now about that dandy little plane you're buying . . ."

Tracing Engine Noises

(*Continued from page* 43)

noise will diminish and almost disappear as the speed is increased, while a piston slap is always present when the engine is idling, accelerating or under full power.

The difference between a noisy tappet and a piston slap at idling speeds may be determined by retarding the spark, at which time valve tappet noises will disappear or become much fainter, while the piston slap will remain the same.

Piston slaps are caused by either too much clearance or score in the cylinder, sticky wrist pins or stuck piston rings. It is easy to confuse with spark or carbon knocks when pulling, as the tone is similar.

There are several methods of finding the particular piston that is slapping, however. The simplest way is to pour some heavy oil in the suspected cylinder and start the engine. This excess of oil will cushion the piston and stop the noise for a few seconds. A compression gauge is also very useful as it will show immediately which cylinder is low on compression. A locophone may also be brought into play.

But remember that no engine should ever be tested for noises until after it has run long enough to warm up properly, as a cold engine will likely have many noises that will be absent when it has reached its running temperature.

Bent connecting or link rods: These are somewhat difficult to identify, but usually occur loudest at idling speeds or on the pick up and generally are steady and always present above six hundred r.p.m. In tone a bent rod is somewhat like a piston slap, but always a little sharper.

The noise caused by a bent or twisted rod is caused by its contact at some point of travel with the piston pin or boss of the piston. The noise cannot be entirely shorted out although this will diminish the sound. And about the only thing to do when trouble of this kind is encountered or suspected is to remove the cylinder and see if there are any signs of wear on the piston boss. (Bright places caused by rubbing or pounding).

Loose Connecting Rod-Bearings: If burned or badly pounded, loose connecting rod bearings will be heard at all speeds and under all conditions. A rod just loose enough to cause a noise is generally loudest at six to eight hundred r.p.m. and is not so pronounced when easing off on the throttle.

The tone is a light pound and sometimes a clatter. Loose rod bearings are best located by removing the spark plug wires from the suspected cylinder or by shorting the wire. The rod will then produce two knocks, both of which will be much less than the original knock. Loose rods unless in very bad condition will seldom show up at idling speeds.

Spark Knock: This a tinkling sound similar to a slight piston slap. It will always disappear when the spark is retarded and is only due to too much advance. A motor should never be run with a continued spark knock as nothing is gained by advancing the spark beyond the maximum advance point.

Carbon Knock: Is always easily recognized because it is loudest under heavy pull or load conditions and when opening the throttle suddenly for rapid acceleration. It will not be diminished by retarding the spark either when idling or when under full power and can only be corrected by removing the carbon.

Loose Cylinder Base Knock: Cylinder base nuts if allowed to become loose will produce a series of knocks, or rather I might say, dull thuds when accelerating the engine. The noise might easily be likened to that produced by some one pounding on a dirt floor and is caused by the movement of the cylinders on their base.

An expert will be able to detect this without running the engine, as careful examination will show that the cylinders have moved on their base; the hold down nuts will in all such cases require tightening.

America's First Aviatrix

(*Continued from page* 44)

and prayed. Once shut off the motor could not be started again so there was no pulling out of a bad landing. The undercarriage was so light that every landing damaged it to some extent and a rough landing wiped it out entirely.

"I believe we were among the first the use 'flaps' on the wings for control. The Wright brothers owned the wing warping patents and collected royalties. My husband devised a set of shoulder braces that acted automatically with the natural reaction to the plane leaning off center. For example if the left wing went down the pilot naturally leaned to the right. The shoulder brace depressed and raised simultaneously the 'flaps' on the trailing edge of the upper wing and the plane righted itself—sometimes.

"I am happy to have lived during the stirring period when flying was young in this country and to have known the great men who made thirty-six hour trips to New York possible."

A solid gold medal encrusted with jewels was presented to Mrs. Raiche by Hiram Maxim, president of the Aeronautical Society. She treasures it for the honor and the inscription it bears "First Woman Aviator in America." After several crackups Mrs. Raiche's health failed and she came West to recuperate. Besides being a flyer she was an expert swimmer, rider, rifle shot and whip.

She determined to become a physician and went to a university, secured a degree and settled in the South of California. There today she is busy with her patients and bringing up a daughter. Few know of her achievements in the air. But at the airport she is well known to the pilots and can often be seen flying as a passenger.

The World's Largest Dirigible

(*Continued from page* 19)

can be increased or decreased 15 tons without making it necessary to valve out lifting gas or ballast.

THE stability of the new Zeppelin will be apparent in another way, particularly if it ever engages in battle. The sixteen 50-caliber rapid fire guns, oversize machine guns firing about 300 rounds a minute, can fire a burst in one direction simultaneously without jarring the craft to any appreciable extent. In fact, naval officials claim that the airship will provide a more steady gun platform than any of their surface craft, and one comparing with solid ground.

In addition to the rapid-fire guns that will have a horizontal range of about three miles, the AKRON will be equipped with bomb racks and probably other armament. One of its secondary functions, in addition to its regular one as a naval scouting craft, will be to bomb enemy property. Other secondary tasks include transportation of emergency supplies and men, convoy escort work, anti-submarine patrolling, raiding enemy communication lines and facilities and guarding our own communications.

In normal duty on the scouting line, the AKRON will not be attacked by airplanes in great force. And even if it should be, it will be able to take care of itself excellently. Even the crude, rigid airships used in the World War demonstrated that a craft of the multicell type can be shot full of holes—can lose a fair portion of its lifting gas, in fact—and still float. A gas cell can be peppered with bullets, and yet lose its contents very slowly. Furthermore, members of the crew apply temporary patches quickly, these later to be replaced by permanent ones.

Civilians often wonder whether a naval airship carries parachutes for its crew. The answer is, "No," with qualifications. Parachutes are not carried for the purpose of saving lives, but only to permit a man to land, without the ship's stopping, in performing messenger or courier duty.

Life-saving chutes are not needed, according to Lt. T. G. W. Settle, chief of the Naval Inspection Office at Akron. The ship will remain afloat as long as any parachute would function; and there is no reason why a man should find it necessary to jump out, he says. Life belts and jackets for keeping the men afloat in water will be part of the equipment, however, because the AKRON, being a naval vessel, will operate most of the time over water.

THE new ship will carry, when fully manned, a crew of 10 or 11 commissioned officers and 35 to 50 enlisted men. These will include the captain, executive officers, eight or nine other officers, a "deck force" or boatswain's mates, a "black gang" of machinists' mates, one or two ship's cooks, a chief radio man and three operators, a machinist's mate for servicing generators and their engines, a general electrician, yeoman, one or two Filipino or colored mess attendants, an aerographer, who prepares weather maps, and so on through the list.

When the AKRON first takes the air she will be manned by a crew of picked navy men and officers, each member trained for his particular duties in the art of handling a giant airship. Ordinarily, the builder of a naval craft carries out all test operations with his own men; but the scarcity of trained airship operators in this country made it necessary for the Navy to agree to furnish the testing crew. In the early stages of its activity, the AKRON will change hands often. In flight, it will be flown by a Navy crew, but while at rest in the dock at Akron, it will belong to the Goodyear-Zeppelin Corp., until it is formally accepted by the government.

It is probable that, after testing at Akron, the ship will be flown to Lakehurst and docked there. One of the reasons for this is that work is to proceed at once on a second ship, a sister craft of the AKRON, at present known as the ZRS-5; and the factory must be cleared for construction activities.

It is expected that, following the completion of the two naval airships now contracted for, lighter-than-air activities at Akron will turn towards the production of commercial craft for transoceanic service to Europe and to the Orient. Two companies have been in existence for more than a year, paving the way for an airline across the Atlantic, and another across the Pacific.

In Germany, work has started on a helium ship that will be used on the Atlantic route, and another craft for this service will be constructed there. Two more are to be built in the United States.

Perhaps a spirited but friendly and cooperative race between the United States and some other country, probably Germany, will develop, in the building of merchant airships. One thing that will be of material aid on this side of the Atlantic, airship men agree, is the favorable action of the Post Office Department in granting mail contracts, and the passing of legislation that will regulate international airship activities much as surface commerce is now controlled.

But regardless of immediate developments, it seems almost certain that the cream of future tranoceanic traffic will be carried on huge lighter-than-air liners. They will get bigger and bigger. The two new naval ships will hold 6,500,000 cubic feet of helium gas and will have a range of 10,000 nautical miles. Plans for a 7,500,000-cubic-foot commercial ship are being drawn. The dock at Akron will hold a 10,000,000-cubic-foot craft. And so on and on.

Meanwhile, Akron is enjoying the pastime of watching the rapid growth of the ship that will carry its name into far corners of the world, and is preparing to entertain vast throngs of curious visitors as the time approaches for launching the greatest American-built Zeppelin, 1931 model.

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Practical Lessons in Flying

(*Continued from page 42*)

the other diagrams. It will be noted that the course speed is now reduced to about 65 M.P.H. in spite of the fact that the air-speed of the ship is still 100 M.P.H.

"If we figured the time of our arrival at (B), or calculated the amount of fuel taken upon the trip, we would find ourselves way short of the mark if we based our estimates upon the air-speed

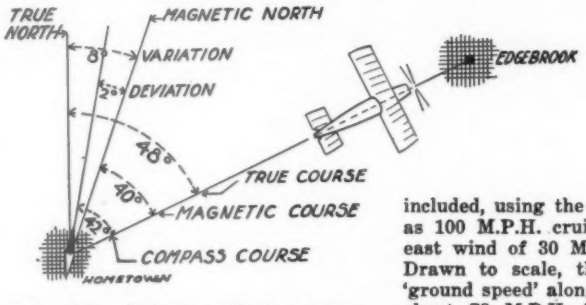

Fig. 5. The course to Edgebrook, corrected for variation and deviation but not for windage.

of the ship. This also affects our compass course, for the ship is now standing at a considerable angle with the course so that the compass reading will not be the same as without wind.

"Now let us take the conditions when reversed, or where the cross-wind comes from behind and increases the course speed above the air-speed of the ship as in Fig. 4. The ship is still travelling 100 M.P.H. in respect to the air, but the resolved speed along the course is now increased to approximately 120 M.P.H. With the wind behind us, the speed increases until the maximum speed is reached with the ship sailing 'before the wind.' With the wind back of the ship and straight along the course, the course speed will be the sum of the wind speed and still-air speed or 140 M.P.H. Now we have the principle of the thing, let us apply it to practice."

"WE ARE going to fly over to Edgebrook again, the mechanics permitting, just as we did in our previous cross-country lesson," explained Ed. "We will now get busy and work out our compass course with the wind

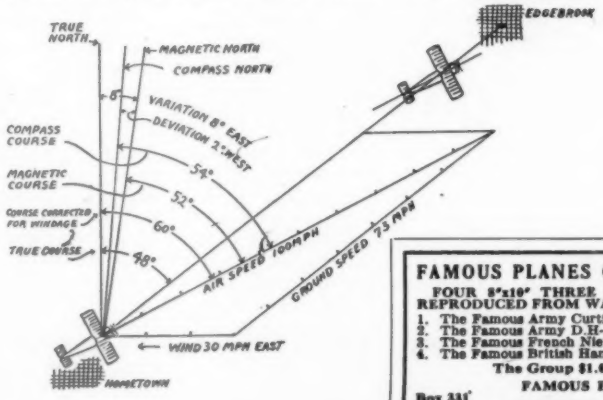

Fig. 6. The course to Edgebrook as it is finally arrived at after correcting for all factors.

first lesson. This, for the sake of reference is reproduced in Fig. 5 with all of the corrections for variation and deviation but with the wind not accounted for. The variation and the deviation angles have not changed in the meantime, so we will simply add the wind factors to the original diagram.

"Now, with the present conditions the air-speed of the ship can be taken included, using the old diagram of the as 100 M.P.H. cruising speed with an east wind of 30 M.P.H., as in Fig. 6. Drawn to scale, this shows that the 'ground speed' along the course will be about 73 M.P.H. in the direction of Edgebrook, and that the compass reading corrected for wind will be 52° East. The true course, taken into account with the wind will be exactly 60° East.

"You see, we draw the resultant line (a-c) as in the first case, and then make our angle measurements to this wind resultant line instead of to the course line. In this way, we have corrected for variation, deviation and wind factor on one diagram, and at the same time have determined the speed on the course.

"It is easier to understand this construction when the diagram of Fig. 6 is compared with that of Fig. 5, the first with wind corrections and the second without them. The angles drawn to the resultant line (a-c) are the same in Fig. 6 except that the resultant angle has been added to them. Notice that the ship continues on its crabwise progress, facing into the wind at an angle determined by the resultant."

Bob looked over the diagram thoughtfully, and then a big idea occurred to him. "What is going to happen when we come home, if we ever do start for hime," he questioned, "do we have to go all through this a second time? I think that I had better bring this thing up before the board of directors before I get bawled out at Edgebrook. Say Ed, does this angle serve us on the return trip or what do we do next?"

"Well, this question is best answered by drawing out a diagram for each end of the route," said Ed, "just as we have done in Fig. 7. Notice that the course speed on the outward trip to Edgebrook is 73 M.P.H. while the return trip is made at the rate of about 120 M.P.H. This is some difference and is accounted for by the reason that we are partly against the wind on our outward trip while the wind is with us to a corresponding extent on the homeward trip.

"We will make a lot better time coming home than we did going out, al-

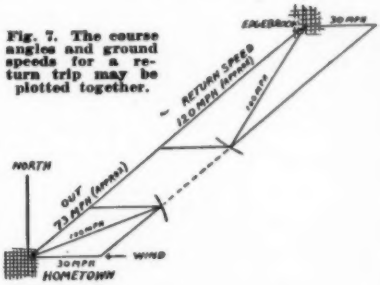

Fig. 7. The course angles and ground speeds for a return trip may be plotted together.

ways providing that the wind holds out. The average speed, out and return, will be equal to half the sum of the outward and returns speeds, or 96.5 M.P.H. taken over the whole trip.

"Now if those mechanics ever finish with the valves, we'll hop over to Edgebrook and see how our figures check up."

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Experimental Crack-Ups

(*Continued from page* 14)

The basic hazard in most aircraft fires is that of the accidental ignition of large quantities of gasoline carried by the plane. With the development and the probably increased use of oil-burning Diesel aircraft motors, this hazard will be still further reduced.

With all this precautionary equipment and design, a great deal of credit in reducing aircraft fires should be given to safety campaigns and measures in the handling of fuels, also explosive or inflammable mixtures. The careful cleaner using a gas spray will first disconnect the battery terminals.

"NO SMOKING" is now an accepted precaution about hangars. Yet, in a small privately-owned hangar last year I saw a mechanic (?) spraying dope on a wing. Dope is highly inflammable, but when sprayed it is highly explosive. This mechanic was busy spraying and smoking. It was a question whether to walk into that hangar and warn the workmen or stand on the side lines and wait for the fun.

Fortunately, the man laid down his spray gun, walked out of the hangar and asked another man for a light, as his cigar had just gone out. The person accosted happened to be the owner and, after expressing himself in no uncertain terms, he discharged the careless one.

Despite the removal of causes leading to aircraft fires, such fires *do* occur, and on such occasions there is an ace-in-the-hole to be resorted to. Many planes have carbon dioxide tanks under high pressure fitted under the motor cowling. With the occurrence of a fire anywhere near the motor, the pilot pulls a handle on the dash board and releases a stream of this fire-blanketing fluid in and around the motor.

Fire, however, is not the only danger encountered in the operation of aircraft. It is an old maxim that it is not the fall that is dangerous but the sudden stop. This sudden stop is called a crash. Another maxim is that a forced landing is sometimes just a forced landing, but if made under certain conditions it becomes a crash.

The broad definition of a forced landing is "any landing made at a time or place not previously meditated." Thus, a forced landing might be due to weather conditions forcing a pilot off his premeditated course and to land, perhaps successfully, upon another field. If he were forced down in poor country, such landing would become a crash.

Forced landings due to weather conditions have been considerably lessened by the excellent system of weather reports which are broadcast at frequent intervals. Small radio receiving sets are very common, and through them the pilot or co-pilot can catch the voice of the Weather Bureau announcer broadcasting flying weather conditions along his route. When a quick change for the worst occurs in weather conditions along a route, these announcements are made frequently. Thus forewarned, the pilot can defer his trip for more favorable weather or, if he happens to be in the air at the time, he can, in most cases, dodge impassable weather or turn back before fog or sleet closes in on him.

Aside from the fire hazard, the worst bugaboo of the passenger-carrying transport pilot is that of being "pinched"—of impassable weather encompassing him on all sides. Weather conditions are in a different category than "Failures of Equipment," but the weather reporting machines are wonderful bits of mechanical perfections.

While the instrument board of most small, cheaply-built planes hardly show more instruments than that of a small cheap automobile, the boards of most of the larger planes, those engaged in transport work, show banks and tiers of instruments of various kinds. This equipment adds to the cost and weight of the plane, but is well worth while because of the added safety they afford.

Many experienced pilots will tell you they barely glance at most of the instruments before them. But let the needle of one of the instruments creep up or drop back on the dial that signals "Danger," and it is surprising how quickly it will catch the eye of an experienced pilot.

Low oil pressure, overheating of motor or oil are all danger signals and, when the needle of the instruments which register these go to forbidden places, the pilot is enabled to take corrective measures or to land voluntarily before motor trouble forces him to land against his will.

When the motor quits the plane must land. Either the pilot must land the plane in a more or less proper manner, or the plane will land itself in a highly improper one. If motors never quit and always acted at top notch efficiency, there would be few forced landings and correspondingly few crashes. Therefore, anything which tends to make motors more reliable would at the same time serve to reduce crashes.

Just as present day automobile motors are more reliable than those of a decade ago, so are aeronautical motors. No one improvement is responsible for this. It is due to increased production and use. The numerous improvements in motor construction and design are the natural result of the competition between many designers and builders to make their products the best that can be devised.

At one time the radial air-cooled engine was looked upon as the last word in reliability. This so stirred up the designers of V and in-line water-cooled engines that these types have become just as reliable as their air-cooled rivals and considerably smoother in operation.

IN ITS day the Liberty was a great motor. Many engineer officers at Army or Navy air stations where this engine was used found it profitable to overhaul them after 100 hours of operation. While some of them were performing well and without any apparent sign of trouble, cold statistics disclosed that many of them, after 100 hours, developed some flaws which caused them to quit more or less abruptly.

A water-cooled engine which is now widely used by the services does not

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NEW YORK

require an overhaul before 150 hours of operation. The average number of hours of operation of this engine before it is pulled from the plane and taken to the shops is 210.

One large operator of transport planes, who made a study of engine operation costs, found that an engine run at full speed invariably gave more trouble than one of the same design run at reduced speed, and also required more frequent overhauls. This operator has therefore equipped his planes with oversized motors to considerable advantage. Since these planes are greatly overpowered, once they are in the air the pilot can reduce the engine speed without appreciably cutting down the speed of the plane.

Since these large sized motors were installed in his planes, this operator has never had a forced landing due to motor trouble. While the cost of their installation is greater, the difference in such cost is made up in the reduction of the number of overhauls and in their not being strained to the utmost to turn out the required horsepower for the operation of the planes.

A statement recently issued by the Army Air Corps revealed that, through the operation of their newly installed Visual Inspection System, forced landings due to airplane and engine failures were cut in half. This system calls for the daily inspection and periodic maintenance of all Army aircraft, engines and other accessories. It also standardizes such inspection and maintenance. Many large operators of commercial aircraft lines have adopted this system, with some modifications to fit their particular cases.

With all such precautions, however, forced landings still occur, and probably always will occur to some extent. Having this in mind, means have been taken to prevent a forced landing or a poorly executed landing from becoming a crash. Usually the first part of a plane to touch the ground is, or should be, its landing gear.

Many planes now have oleo landing gears, consisting of rubber plungers operating in a bath of heavy oil. Although heavier than the old rubber-cord type of shock absorber, this oleo type is a good ground-hugger and generally better in preventing a plane from landing in "graceful leaps and bounds."

A considerable number of planes are now equipped with brakes on the landing wheels, which not only prevent a landing plane from overshooting or overrunning the field but aid considerably in taxying about a field prior to taking off or after landing.

Several years ago during the sudden boom in the manufacture of airplanes, cabin planes were built which had exceptionally poor visibility from certain angles. Pilots invariably shunned such planes and, if forced to fly them, did not hesitate in making their dislikes known. As a result, most of such planes were re-designed to give better visibility to the pilot so that he might not scratch the tree tops in making a landing or take off from a field with another plane landing close beside or over him.

Rain, which in many cases is uncomfortable but not impassable, was formerly capable of giving much trouble when planes were equipped with wooden propellers. A moderate rain would score the entering edge of a wooden propeller so that it looked as if it were hacked with a hacket. Steel propellers are now the rule for all but the smallest of planes. Navy pilots appreciate this more than others, for they are often forced to take off seaplanes through choppy waves with sheets of spray dashing over the whirling propellers as they pick up speed on the water.

Cabin planes are universally fitted with non-shatterable glass panes. The forward cowling of primary training planes are also equipped with non-shatterable glass panes. The forward cowling of primary training planes are also equipped with "'crash pads." These overstuffed pads are far more comfortable for one's forehead to strike than the sharp edge of the normal cowling or the frame of a compass on the instrument board.

Safety belts, parachutes and the like might be classed as aerial life preservers. Their use requires some practice and their misuse sometimes results in severe injury. One of the most dangerous things the occupant of the rear seat of the average bi-place airplane can do in the case of a poor landing is to unbuckle his safety belt. This also applies to landings in the water, or any landing where the plane might nose over and pitch its tail in the air. More than one rear-seat occupant has been pitched out over the center section into the water or on the ground when he cast off his safety belt prior to what looked like a bad landing.

Propellers have taken their toll of lives of mechanics engaged in starting aircraft motors by whirling them by hand. Nowadays self-starters are installed on many airplane motors, making starting not only easy and quick, but much safer than with the old fashioned "Off—Contact" plus strong-arm method of cranking propellers.

The extreme usefulness of the parachute in promoting greater safety in flying is now too well known to warrant going into any detail regarding this highly efficient component of an aviator's equipment. Suffice it to say that thus far the parachute was instrumental in saving the lives of 357 persons in this country, which is a remarkable record to say the least.

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How to Build the Heath Parasol (*Continued from page* 39)

outside of the nailing strips beneath the top longeron with brass wood screws (V-721) spaced about 2" apart. Make a small angle bracket and rivet (V-724) to the underside of the cowling directly back of the top of the instrument board. Bolt (V-732) to the board.

Motor Cowling

When the motor has been bolted in place, fit the cowl plate (V-727) in place on the front of the motor. Cut out on the plate for the ribs on the thrust bearing case and be sure before marking for the bolt holes that the rim is concentric with the propeller shaft. The same screws which hold the thrust bearing case to the motor are used to hold the cowl plate.

Prepare the cowl plate to receive the cowling screws (V-731) by holding it in place against the thrust bearing case and marking a top center and a bottom center on the flange. Make from V-729 three small angles about 1½" long to fit against the underside of the flange with their outside ends extending ¼" past the edge of the flange. In each of these three pieces drill a 3/16" hole centered 3/16" from the end in that part which extends over the flange.

Solder a No. 10-32 nut (V-731) to the underside of this hole and run a No. 10-32 tap through it. Drill in each piece two ⅛" rivet holes. Rivet (V-724) one of these at the top center mark and the other two at points measured along the edge of the flange, 8¾" either way from the bottom center mark.

The bottom cowl will be made first, but before cutting any more aluminum it is advisable to make full-sized paper patterns of all of the cowl pieces and place them together upon the aluminum sheets (V-720) so that there will be no waste in cutting. Shear the bottom cowl as shown in detail No. 1, cowl print. Clamp in place and trim off the margins. Allow a 1" lap and a ¼" turnover at the fuselage end.

Cut out at the lower corners for the wire pulls. Shear off flush with the forward edge of the cowl plate. Fold each of the two upper edges over a length of soft iron wire (V-722) and rivet (V-724) the folds down in two places as shown in your print; together with a ⅞" long piece of ½"x22 ga. sheet steel. This last item is for the cowling screws. Drill through the folds in the aluminum and each of these steel pieces ⅛" holes for the rivets and an 11/64" hole, which you will tap out with a No. 10-32 tap for the cowling screws.

With a chisel cut three louvres as shown in your print, and hammer open to the inside for the admission of air to cool the oil sump.

Fit the cowl snugly in place and drill 13/64" holes to register with the holes in the ears on the fuselage and on the cowl plate. A rope snubbed tightly around the cowling and engine is of assistance in fitting. Bolt (V-731) the lower cowling in place. The washers should be soldered to the heads of the machine screws which are used as cowling screws and they should be pointed for ease in inserting.

The left top cowling (detail No. 3) is easily made as your drawing shows. Wire is rolled into the edge around the engine and the piece is fastened to the top of the cowl plate and to the upper edge of the lower cowl with cowling screws. An offset locking flange is put into the edge which lies behind the engine as shown in detail No. 7. The vent cover is riveted (V-724) to the rear edge of the cowl as shown in the print and a stiffening strip of steel (V-733) is bowed to shape and riveted (V-724) across the vent opening.

The right top cowling is in two pieces and forms the air scoop for cooling the motor. Wire is rolled into the forward edge of the rear piece and into the turned up rear part of the front piece. The front piece is bolted to the top of the cowl plate (V-731) and to the upper edge of the bottom cowl. The rear piece is bolted to the upper edge of the bottom cowl and held with a locking flange at its upper rear part and fastened to a stud on the top of the second cylinder on the engine.

The Windshield

CUT from V-740 a windshield in the shape shown in your print and drill at equal intervals along its bottom or straight edge, centered ⅝" from the edge, five ⅛" holes for rivets. From V-743 make five angle brackets 1¼" long and drill two ⅛" holes in each, centered ¼" from the ends.

Rivet (V-741) the brackets and washers (V-742) to the windshield. Hold in the desired position about 40 degrees from vertical and mark the top cowling for bolt holes. Drill and attach the windshield with V-744.

Propeller Spinner

MOUNT the propeller on its hub and attach the spinner plate (V-726) to the rear of the propeller hub, using the regular hub bolts. Cut away enough material from the spinner (V-725) to admit the blades of the propeller and mark along its edge the position of eight holes for No. 4-36 screws (V-730). Clamp the edges of the spinner and the plate together and drill the holes with a 7/64" drill so that they come about midway on the flange of the spinner plate.

Cut from V-728 eight strips ¾" long. Drill a ⅛" hole in each strip centered ¼" from the end. Over one hole in each piece solder a No. 4-36 nut (V-730). Bend each piece to fit under the flange of the spinner plate so that the nut is over the 7/64" hole in the plate. Drill a ⅛" hole in the plate for a rivet for each angle bracket and rivet (V-724) in place.

Final Assembly

CONNECT the motor. Be sure that the gas line has no kinks or loops in it and that it is clear. Be sure that there is gas hose at each end of any gas line. Be sure that there is a rubber hose connection between the gascolator and the carburetor. Be sure that the gascolator is installed so that the fuel flows in the indicated direction.

Assemble the under-carriage and the tail group on the fuselage. Test your controls to be sure that they have not been cross connected. The elevators should come up when the stick is brought back. Check all turnbuckles and bolts to see that they are properly "safe-tyed" with copper wire or cotter pins. Coat the lashings on the shock cord with "dope." Mount the tires (V-646).

Bolt the propeller to the engine and arrange a temporary gasoline feed and test out your motor. Be sure that you have six quarts of clean oil in the sump. The motor should turn up 2,700 r.p.m. with a standard Heath propeller on the ground. Screw the cowling in place and your HEATH PARASOL is ready to be transported to a field where, after attaching the wings, you will begin the first of hundreds of hours of joyous flight.

States to Limit Aircraft

(*Continued from page* 40)

discriminatory and to oppress private enterprise.

"The U. S. Department of Commerce recognizes the right of a citizen to fly any airplane and in its regulations provides that such aircraft as are not being used as public conveyances nor for commercial purposes need not be licensed and may be legally flown. Identification numbers for unlicensed airplanes are granted upon request.

"Some individual states, however, through overenthusiasm for public safety and a lack of sympathy for the progress of aviation have neglected this provision to the great detriment of private plane owners and to the impediment of experimentors."

Aircraft Instruments

(*Continued from page* 31)

Proper banking of the ship is accomplished with the aid of a lateral inclinometer of the ball type, although as mentioned before, this can be determined to a certain extent by "feel." However, a lateral inclinometer is important to indicate "cross-level" when flying straight, a condition distinct from banking in a turn.

For pitch, it is customary to use a gyroscope, a longitudinal inclinometer or a rate of climb indicator, which provides an indirect measurement of pitch.

Even though these instruments are simple, it is fatiguing for a pilot to fly for any length of time depending on them solely, for the reason that he has to interpret several indications and coordinate them in his mind before he makes any control movement that may be necessary. He is accustomed to watching the horizon and performing his three dimensional control with respect to it, not resolving it into its three components.

Consequently, attention is being paid to simplifying the system of indications which has led to arrangements of instruments in geometric patterns and also to artificial horizons.

The next development which is well on its way is to relieve the pilot entirely from the necessity of acting as an intermediary between the instruments and the controls. This is the function of automatic control.

Mother Tusch's "Hangar"

(*Continued from page* 36)

not written by the hand of its owner—that of Frank Luke, Jr., a neighbor boy, who left saying he would return with feathers in his cap and place his name high up among the honored ones—but he was among the first to fall out there in France, and his father asked permission to place it there for him.

The walls of the little structure are literally covered with the flags of all nations, ragged and dirty, rent by shells, and saturated with blood; with squadron insignia of all Allied forces, and even one from an enemy plane; with rifles of every description; with posters both foreign and American.

Everywhere are pictures — photographs of boys in uniform and in "civies"—big ones and small ones of smiling youths who flew into battle with no thought of tomorrow, of thoughtful men with serious faces well trained in the knowledge of war—but all of them of men who risked their lives for their country and the future of aviation.

About the rooms stand machine guns, chairs, tables fashioned out of propellers, gas masks, canteens, trench lanterns, armor, a helmet—the headgear of an officer of the Imperial German guard with its gold crowned silver eagle.

In cases lining the walls lie medals, torn from the breasts of conquered enemies or treasured bits of metal which signify a brave deed recognized; hat cords of gold; goggles worn threadbare through constant service; a mess kit; a cigarette case with iron cross inside; a jaunty overseas cap; a miscellaneous collection of bullets, buttons, rings, money (both paper and coins), good luck charms, emblems, leather helmets and chevrons.

On one wall hangs a priceless souvenir—presented to Mother Tusch by Dean F. H. Probert, head of the Mining department of University of California, because he felt that it belonged there in her home.

It is a section of the fuselage of the ill-fated ship flown in 1919 by Fred Waterhouse and Cecil Connelly when they disappeared from all knowledge of man while on a border patrol flight and were never heard of again until their bullet-ridden bodies were found in a shallow grave over the Mexican border.

Sixteen irregular tally marks scratched on the fuselage along with their story gave mute testimony of the horrible thirst-filled days which preceded their death.

All of these souvenirs have been given to Mother Tusch by flyers. Scarcely a week goes by even now without one of "her boys" sending some new treasure. It is a museum that shall never know completion. It is a shrine where names shall live. And in this unique hangar lives "Mother" Tusch, the beloved friend of the world of aviation. Many aviators say her friendship is a good luck charm.

The Navy Selects Planes

(*Continued from page* 31)

River, is the speed course that is used for the Curtiss Marine Trophy Race every year, the course where many new speed records have been hung up.

Each plane undergoing test has much to do on this measured course. It is tested for its high speed, its cruising speed; its speed with varying loads and military equipment.

Generally, two months suffice for each Anacostia test, but after the test pilots have submitted their written observations—made after each flight—and Lieutenant Ralph A. Ofstie, flight test officer, has received them, neatly bound together, there's not much more to know about the plane they have tested.

Even the propeller has been tested by a series of runs to determine its speed characteristics at various blade settings, and sometimes various propellers are tried to find the one best suited to the plane under test. All the information is then submitted to the Bureau of Aeronautics.

The Flight Test Section is also interested in developing and improving present types of planes and is not infrequently assigned the difficult task of getting "more miles per gallon" out of a plane type that is already widely used in the service.

Developing better equipment for altitude flying is another mission of the test pilots at Anacostia. Many of the altitude flights have as their objective the testing of oxygen equipment.

In combat, the pilot whose plane has the highest ceiling will be able to outmaneuver his antagonist with ease, while commercially, altitude-flying opens great possibilties for development.

When the equipment for such flying has been perfected, flight time can be materially reduced, for then the pilot will be able to take advantage of the high winds aloft.

And so the work of testing goes on at Anacostia. The work they have done and are doing plays an important part in assuring America's supremacy in the air, both from a military and commercial standpoint.

Model Builders

(*Continued from page* 45)

NORMAN P. MARENGO of New York City offers us a picture of his Fairchild model (built from POPULAR AVIATION plans) that "flew like a bird" until on its thirtieth flight, "something went wrong," and it cracked up. Nothing daunted, Norman is going to try his hand on a Fokker model.

ALFRED Federman of Cleveland, Ohio, who is very much delighted with our Fokker triplane plans, submits a picture of his S. E. 5 which is a very business-like looking model. Alfred writes:

I made an S. E. 5 modified from the plans in your magazine and it flew 180 *feet. It was also placed on display in Cleveland during the first city showing of "Hell's Angels" at the Stillman Theatre.*

YOUNG CUBA is not to be ignored. Ernesto Tabio, from Havana, writes a very interesting letter and sends a picture of a model Nieuport Scout. The Nieuport was built by another Cuban enthusiast, V. Pina, and is equipped with an exact reproduction of a rotary Gnome motor carved out of wood with a penknife.

PICTURES from V. M. Bilson of Newport News, Va.; Ralph J. Zella of Milwaukee, Wis., and Mortimer Rosenbaum of Plainfield, N. J., proved unsuitable for reproduction, but letters accompanying the photographs were very interesting.

POPULAR AVIATION is always glad to receive photographs of model airplanes and gliders. In selecting pictures for our use, however, be sure that the print is clear and clean-cut.

Probably numerous other letters and pictures will be received by the time this issue goes to press, so if your contributions fail to appear, don't be discouraged. Probably they will be used in future issues.

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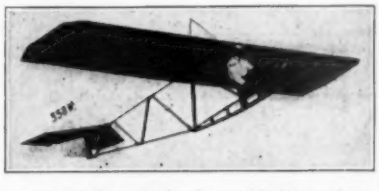

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An Airy Chat with the Editor

(*Continued from page 6*)

still be represented as a minus quantity.

Can't you see that your model boat articles are going to go over big? Ye Gods, man, use your brains.

So that's that. Now you know what one fellow thinks about it.

* * *

THIS month's installment on "How to Build the Heath Parasol" concludes the series. We have heard of several POPULAR AVIATION readers who are building their own planes from these plans and one of them is going to get himself a pretty swell chronometer when he flies his plane. As we stated elsewhere in this issue, POPULAR AVIATION will award a $100 Longines chronometer to the first one who flies his own Heath Parasol built from POPULAR AVIATION plans.

* * *

FOR several months past we have been running biographical sketches of well-known pilots in present day aviation. This month we had prepared an article on Speed Holman. With his life and achievements fresh in our minds it was a distinct shock to pick up the newspapers of May 18 and read of his tragic death at Omaha the day before.

Charles W. Holman was too well known and liked to need any detailed eulogy here. He has gone to join a host of others who have sacrificed their lives needlessly to give the crowd a thrill. Unfortunately, it is almost always the pilot of distinction who meets death in spectacular but unnecessary stunts such as brought about Holman's untimely end.

Aviation can ill afford to lose men of Speed Holman's type, but it will continue to lose them until the public adopts a saner attitude towards dangerous stunting for the sake of thrills.

* * *

WELL, if we keep on chatting forever about this, that and the other thing, we never will get around to the batch of interesting letters that we have in store for you this month. So we might as well start off right now with this letter from W. D. Shelton Jr. of Richmond, Va.:

I had an argument with my teacher over Capt. Purcell's scrap with the women and she told me I was too young to know much about women, but I kept on arguing until I finally made her give in.

I think you might like to know how I came to read your magazine.

One day my public speaking teacher came to me and told me I had to make a ten-minute speech on aviation. I was in a storm until I went into a drug store. The first thing I saw was POPULAR AVIATION. *It flashed into my mind that I might get enough information from this to make my talk. I purchased the magazine and prepared my talk, but when I got up I talked twenty-five minutes and was called down by her. I could have talked a week on what I received from one issue of your interesting magazine.*

If you should ask Captain Purcell he would probably say that you shouldn't argue with women and more particularly with teachers.

* * *

SPEAKING of Captain Purcell and his article on women, it seems that the fight is still on, because we got a sizzling hot letter from him saying that he is still sticking to his guns. He seems to resent the comments on his flying ability and says that "if any of the rest of 'em want to know, tell 'em I started flying in April, 1915, in the United States Army and I have been flying ever since."

Miss V. Leora Blaisdell, one of the captain's opponents, writes the following about her article in last month's POPULAR AVIATION:

I note that two or three of my juiciest bits were omitted, but I am well aware of the fact that this omission is sometimes necessary. However, there appears one change from the original manuscript that I really regret. In the second paragraph of my article, "Pain-in-the-Pants" should have read "Pain-in-the-Pancreas." Neither name is elegant, but the suggestion of vulgarity conveyed in the name which appeared in the published article is offensive, I think. I want to ask you to make a correction in the next issue of POPULAR AVIATION, *if you will, please.*

To Miss Blaisdell we extend our sincere apologies that this unfortunate error was not discovered before the issue went to press.

We are looking for the day when the hatchet will be buried, because, *officially*, this battle was called off last month.

* * *

POPULAR AVIATION readers are certainly widely scattered around the globe. Let's take a jaunt around and see what these correspondents from outside the States have to say. Here is Harry Bailey Wilston of Huntsville, Ontario, who writes:

Aviation in Canada is certainly making progress. The inauguration of a transcontinental air mail service is just about completed.

I have done considerable barnstorming this winter with a Canadian war pilot in an Eaglerock biplane. The numerous Muskoka Lakes make fine landing fields for skiis at this time of the year.

I had my first instruction flight in a biplane equipped with floats, and I practically made the take-off and landing without aid from my instructor.

* * *

And here is a very interesting letter from C. J. Burchell of London, England. Mr. Burchell writes:

Writing as the father of Model Aeronautics in this country and in reference to your proposal to include in POPULAR AVIATION *chapters on model motor boat building, may I ask that in any case you do not curtail the little we over here get in respect to aero models. We are starved for designs on this side and I believe an increasing number are buying the journal just because it is the only one we can get that can be depended on to produce a regular design each month. There is no such publication on this side, and, even if we do not build all the models shown, we do at least study them and try to fit them to our needs where the conditions are so different and materials as used in America so very unsuitable.*

Our aims, too, are so very different for our idea is to carry a load at good speed and drive it with the least power to get the result. Duration, except amongst a few, does not so much matter providing we can get enough to see our model well up and view it as a real machine—to make a perfect landing at the end of the run and not be damaged in any way, so that we can repeat the performance time after time to the joy of ourselves and the spectators.

We use and experiment with other powers as well as rubber—compressed air, steam, clockwork and any other means possible. Even electricity, which now seems possible again, although I well remember in 1910 seeing an electric-driven machine flying down the street about 10 feet up.

Now perhaps just a few words about myself, which I think entitles me to write this. I took up the game in 1900 and have been in it ever since. I am now right in the thick of all aero model activities in this country and hope to be for a long time yet. At this moment I hold 3 records in this country, that is, two separate gliding records and the single pusher.

At the moment I have a Cabin Bus Honeymoon Coupe model, which will fly 30 seconds, has a 9-ounce loading, the weight being 9 ounces all on, and the rubber to drive this weighs exactly 14½ drams, or, roughly, a ratio of 9-1. How's that?

(*Continued on page 64*)

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Air Mail Covers

(*Continued from page 35*)

very popular because special cachets, both unofficial and official are used and in many cases, special postage stamps are issued. Other covers are the Express, Emergency, Anniversary, and Air Tour covers.

One of the most popular and most sought-for cover is the Accident cover. In most cases these are practically all commercial mail and a very few find their way into the hands of collectors, although there have been cases like the first flight of C. A. M. No. 25, which crashed into the Halifax River at Daytona, Florida, and a few others in which most of the mail belonged to collectors.

In many instances fire destroys much of the mail and the letters that are salvaged usually bear a cachet applied by the postmaster or inspector identifying them as Crash covers. The majority of Crash covers command a high price on the market and are much sought after by the average collector.

Historical covers, those carried on flights across the ocean, to the North and South Pole, and those carried on other notable flights, are also scarce and expensive. In most cases these covers bear no cachet or postmark but a written inscription signed by the pilot or other members of the crew.

Another very good cover is the Autographed cover. All collectors like to have their covers autographed by the inaugural pilot or by the guest pilots. A few notable flyers refuse to autograph and covers with these autographs are scarce and very high priced and are found in only one or two collections.

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7 **Airplane Engines**
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8 **Aerostatics**
by Edward P. Warner
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9 **Winged Defense**
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An Airy Chat with the Editor

(*Continued from page 62*)

Then we skip over to Cuba to our friend Ernesto Tabio of Habana, who is one of our regular correspondents. Mr. Tabio is an enthusiastic model builder and has learned his English largely by reading English and Amer-

Members of the Model Airplane Club at Habana, Cuba.

ican aviation magazines. We give you his letter just as he wrote it:

At last we have founded the First model airplane Club in the Republic of Cuba. The interest in the model airplane construction grows rapidly among the Cuban youth. The enclosed photograph is of the first group of our Club. The Pioneers of this movement are V. Pina (No. 1), A. McGrigor (No. 2), and myself (No. 3). Since 1927 we are building and flying model airplanes.

The Motto of our Society is the "Promotion of the popular aviation in Cuba," and perhaps in a near future, to the Latin America in general. We are going to develop our efforts in the construction of gliders and light planes. In Cuba there is a "Cuban Flying Club," but their efforts are driven, to give training to the pilots that have 50 hours or more, the other members can't pilot the planes. The members of this Club are the Cuban Air Corps officers and the graduated of the Curtis Flying College. They have two Wacos.

Very soon I will give you an additional information about our Club.

* * *

NOW that we had a little tour around the map, let's come back home and see what Robert J. Whelan Jr. of Garden City, N. Y., has to say:

My views on your magazine follow: I think that as a whole it is worth all of the price asked for it, but some of the articles I wish to criticise. For instance, in your Model Department I think it would be a good idea if the author of the various planes submitted cut down the size of his models, as the ones presented are too large for various reasons: (1) It takes too much material to construct a 30" model; (2) its weight is too great for it to make a very successful model; (3) the propeller has to be too large in order to propel it through the air with enough speed to maintain flight; (4) and lastly the cost is quite unnecessarily high to build said model.

Therefore, I think a model of the Fokker "try's," like in this issue, should be kept down to about 24" or 20".

Well, Robert, if you will look at this month's model section, you will see what we have done for you and a lot of other model builders. This month you will find that the plans for the Nieuport Scout have no dimensions at all on them, but they are reproduced exactly to scale and are shown in the magazine with a wing span of six inches. By multiplying all dimensions by four, you can build a perfect 24-inch model, and those who want 30 or 36 inches, even 12 or 18 inches, can build their models just as easily by multiplying the dimensions shown by the proper factor.

Also this month for a change we are not distributing free plans of the model, but instead are offering ten prizes for the ten best photographs of models built from these plans. Pictures must be accompanied by letters which express the builders' opinions as to whether they do or do not like the model plans published to scale but without actual dimensions. You can find a full announcement of this contest in the model department.

* * *

EARL SHARP of Little Rock, Ark., had a thrilling experience recently. Just listen to this!

Recently a friend and I were standing by a fence post at the airport minding our own business, whatever that was, and an American Eaglet Parasol was warming up about fifty yards away.

I suddenly became interested in a training ship coming in for a landing. Evidently the student was juggling the stick, because the plane undershot several hundred yards and banked away. I was so interested in the plane that I didn't hear another sound until I heard my friend shouting, "Duck! quick, Nit wit! naw, this way!"

Did I jump? I'll say I jumped! The parasol roared by on a take-off. Its left wing passed right where my head had been!

P. S. That's no home-spun yarn, either.

Well, Earl, if you don't get bumped off by some of these low-flying aviators one of these days, we look forward to your getting some flying of your own.

* * *

GORDON PLAXTON of Detroit, Mich., had some tough luck, but seems to have gotten out of it very nicely. Here's what he says:

I recently won 4th place in a scale model airplane contest. The night before the contest I took the finished model over to a friend's house. I had the misfortune of running into another person with the plane in my hands. It was wrecked, even the dihedral in the upper wing was taken out.

Dear Mr. Frawley:
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I skipped school the next day and rebuilt the plane, and am very glad I did so. The model was of a Waco "F," solid scale, movable controls, and shock absorbers in the landing gear. As fourth prize I will receive ½ (one-half) hrs. flying instruction at Triangle Flying Service Field. I hope to continue flying this summer.

* * *

NOW here's Joe Gillis, 1516 North Avenue, Niagara Falls, N. Y. Joe saves clipping and photos of airplanes and would like to know of any other POPULAR AVIATION fans with whom he may swap.

Fred Quick, 305 North Clayton Street, Bloomington, Ill., has a Boeing P12-B and a Curtiss Hawk scale model for sale. Fred sent us photographs of some of his models which look like nice neat jobs, but unfortunately the pictures were not quite clear enough for reproduction.

* * *

DAVID NOGUCHI of Sacramento, Cal., is a Japanese boy but was born in this country. He writes that he is "bugs on aviation" and spends all his spare time making models and drawing planes. He suggests that we publish some of these drawings by readers. "I have been hearing so much about these drawings in the Chat column lately," he writes, "that I'm all on edge wanting to see what they look like. Maybe I'll send some along when I turn out some good ones."

That's a good idea, David. Send along some of your drawings any time, and that goes for all the rest of you airplane artists. The only drawings we got this month were two more from Billy Metzger of 1440 Clarence Avenue, Lakewood, Ohio. One is a particularly snappy action view of a dog-fight between Spads and Fokkers.

* * *

WILLIAM BACH of Narbeth, Pa., was one of many who wrote concerning the engine directory described on page 22 of the April POPULAR AVIATION. This completely illustrated directory is published and mailed free upon request by the International Nickel Co., Inc., at 67 Wall Street, New York, N. Y.

Mr. Bach also asks: "Could you tell me just how successful the Curtiss-Bleecker helicopter has been?"

We couldn't answer that question offhand, so we wrote to Curtiss-Wright and received the following reply:

The helicopter is still at Valley Stream, but will be moved in the near future to Buffalo, where final tests will be carried out. There is no way of telling in advance what the outcome of the final tests will be. Naturally, we hope they will be fully successful.

If they are, the next step will be to consider production of one or more models involving the Bleecker principles. If they fail, we shall close our records on this particular design.

* * *

WE are beginning already to get advance dope on the 1931 national air races. If you don't know it already, they are going to be held at Cleveland, Ohio, from August 29 to September 7th. It's a little too soon yet to go into all the details of just what is going to take place, but there should be some interesting developments from now on.

* * *

ONLY one or two readers caught a mistake that was published in the June issue, but in the interest of accuracy we want to make the following correction: On page 18 (last month) the war plane that was identified as a Salamander is either a Sopwith Camel or a Sopwith Pup. Wartime aviators or anyone else who can make a positive identification will confer a favor upon this magazine by writing us.

This brings up the subject of war planes in general. We have a tremendous continued demand from readers all over the world to publish more pictures of these famous planes and we are willing and anxious to do so, but it has been an awful job to get hold of these photographs. We have received a number of photographs that are very obviously misidentified, and, of course, are therefore unsuited to publication. We would be particularly glad to get in touch with anybody who can furnish us with authentic photographs of war designs that are positively identified. We know that there must be many such photographs in the private collections of former war fliers, and if these pictures are loaned to us for reproduction, POPULAR AVIATION can promise to return them uninjured to the owners. A case in point is that Lieutenant Richardson often has loaned us irreplaceable war photographs for reproduction, and these have been returned to him in perfect condition. Also, see Lt. Heinsen's pictures in this issue.

* * *

MR. SAMUEL E. W. HAINES, 430 Queen Anne Road, Teaneck, N. J., sent us an announcement of an interesting experiment. He asks the cooperation of pilots and would be glad to hear from anyone whose business takes them over that neck of the woods.

A powerful fog penetrating searchlight is being tried out at Leonia, N. J., 1,500 feet North of the Erie Station and near the tracks at the edge of the Iverpeck Meadows, nearly every night between 9 and 10:30. Aviators' reports of this light are requested.

At the present time the machine is sending up vertically twelve shafts of light arranged to form the figure 5 with patches of light in that formation on the under side of the fog and on the upper surface of the fog, or on the underside of a cloud and the upper side of a cloud.

The information which we seek particularly is how far away the light patches can be seen after they emerge above the fog or cloud assuming the aviator is flying at great height. It has already been reported by pedestrians who have observed from a distance, that the shafts go right through four layers of clouds.

* * *

MISS ANN BOHRER, who wrote a very interesting yarn for POPULAR AVIATION a couple of months ago, sent us a surprise package this month. It consisted of a beautiful hand-wrought copy of that most delightfully goofy aviation magazine, *Tale Spins* edited by her brother, Walt, and containing a monthly column by herself. We recommend that you obtain a copy of *Tale Spins*.

By its own statement, the magazine can be obtained "at airports, on streets or in restaurants" for 15c. In "mudholes, ashcans or sewers," the paper is free. If you'd like to subscribe, *Tale Spins* will be glad to take your order for 25 years at $37.50, 100 years at $150 or 500 years at $750. Do you wonder the durned thing labels itself "the monkey glands of aviation?"

* * *

WELL, that seems to be about all for this month. As usual, there were a lot of letters which we didn't have room to publish, but we were glad to hear from all of you just the same. See you all next month.

NOTICE!

It has been brought to our attention that there are a number of self-appointed salesmen throughout the country that are representing themselves as POPULAR AVIATION subscription agents. POPULAR AVIATION does **NOT** employ any direct agents. Subscriptions should be mailed to POPULAR AVIATION or they may be placed through any established subscription agency or newsdealer.

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